U.S. Department
of Transportation

Federal Aviation Administration

Advisory Circular

/REPRINT INCLUDES CHANGE 1/

Subject: PLANNING AND DESIGN GUIDELINES FOR AIRPORT TERMINAL FACILITIES

Date: 4/22/88
Initiated by: AAS- 100

AC No: 150/5360-13
change:

1. PURPOSE. This advisory circular (AC) provides guidelines for the planning and design of airport terminal buildings and related access facilities.

2. CANCELLATION. The following advisory circulars are canceled:

a. AC 150/5360-6, Airport Terminal Building Development with Federal Participation, dated October 5, 1976.

b. AC **150/5360-7,** Planning and Design Considerations for Airport Terminal Building Development, dated October 5, 1976.

3. RELATED READING MATERIAL. Appendix 1 contains a listing of documents with supplemental material relating to the planning and design of airport terminal facilities and how they may be obtained.

Leonard E. Mudd
Director, Office of Airport Standards

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66. GENERAL. This chapter provides guidance on spatial requirements for functions carried out in an airport terminal building. The guidance is indicative of the design range in use at U.S. airports to accommodate domestic scheduled passenger operations. Adjustments may be necessary for international, charter, nonscheduled, or third level operations. Airport terminals should be designed for a capacity to meet the projected needs of the community being served. This guidance should only be applied after consultation with the airlines, FAA, other users, and tenants. Modifications to the guidance may be warranted after such discussions.

67. GROSS TERMINAL BUILDING AREA ESTIMATES.

a. Gross Terminal Area Per Gate. The relationship between annual enplaned passengers and gross terminal area per gate for a IO-year and 20-year forecast is approximated in Figures 5-l and 5-2, respectively. The profile of the curves is based on predicted growth in seats per aircraft for each forecast period; specifically, the growth in predicted aircraft mix during the peak hour of the average day of the peak month of the design year. With a 10 or 20 year forecast of annual enplanements and an approximate required number of gates determined by the procedures discussed in paragraphs 25 through 27, an approximation of gross terminal area can be made.

b. Rule-of-Thumb. A rule-of-thumb of about 150 square feet (14 m^2) of gross terminal building area per design peak-hour passenger is sometimes used for rough estimating purposes Another rule using 0.08 to 0.12 square feet (0.007 to 0.011 m^2) per annual enplanement at airports with over 250,000 annual enplanements can similarly be applied. At small airports with less than 250,000 enplanements, estimates should be based on peak hour considerations and simple sketches (see AC 150/5360-9).

68. SPACE ALLOCATIONS. The terminal building area is comprised of both usable and unusable space. Unusable space involves those areas required for building columns and exterior and interior walls, about 5 percent of the total gross area. The usable space can be classified into the two broad categories of rentable and nonrentable space. Usually, 50 to 55 percent is allocated to rentable space and 45 to 50 percent to nonrentable space. Figure 5-3 presents a further breakdown of these basic categories.

69. PUBLIC LOBBY AREAS. Lobbies provide public circulation and access for carrying out the following functions: passenger ticketing; passenger and visitor waiting; housing concession areas and other passenger services; and baggage claim.

a. Ticketing Lobby.

(1) As the initial objective of most passengers, the ticketing lobby should be arranged so that the enplaning passenger has immediate access and clear visibility to the individual airline ticket counters upon entering the building. Circulation patterns should allow the option of bypassing counters with minimum interference. Provisions for seating should be minimal to avoid congestion and encourage passengers to proceed to the gate area.

(2) Ticket lobby sizing is a function of total length of airline counter frontage; queuing space in front of counters; and, additional space for lateral circulation to facilitate passenger movements. Queuing space requires a minimum of 12 to 15 feet (4 to 5 m). Lobby depths in front of the ticket counter range from 20 to 30 feet (12 to 15 m) for a ticket area serving 50 gates or more.

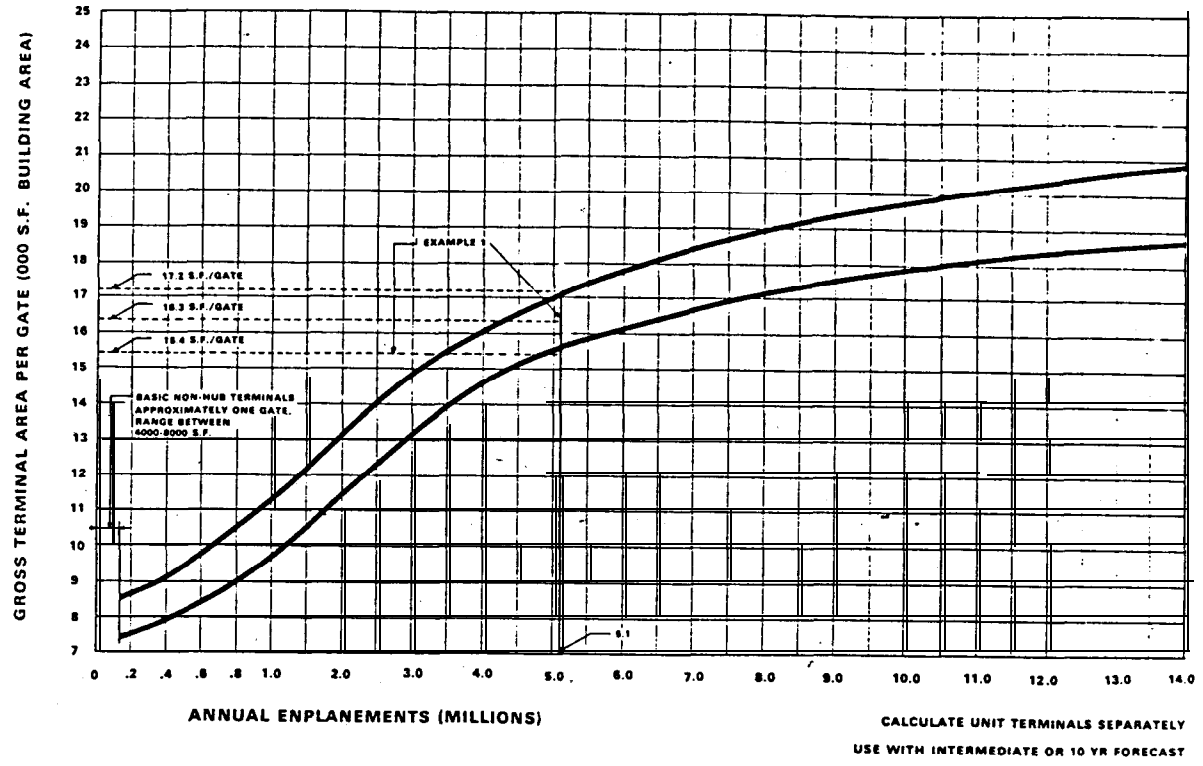


Figure 5–1. Gross Terminal Area Per Gate – Intermediate Planning

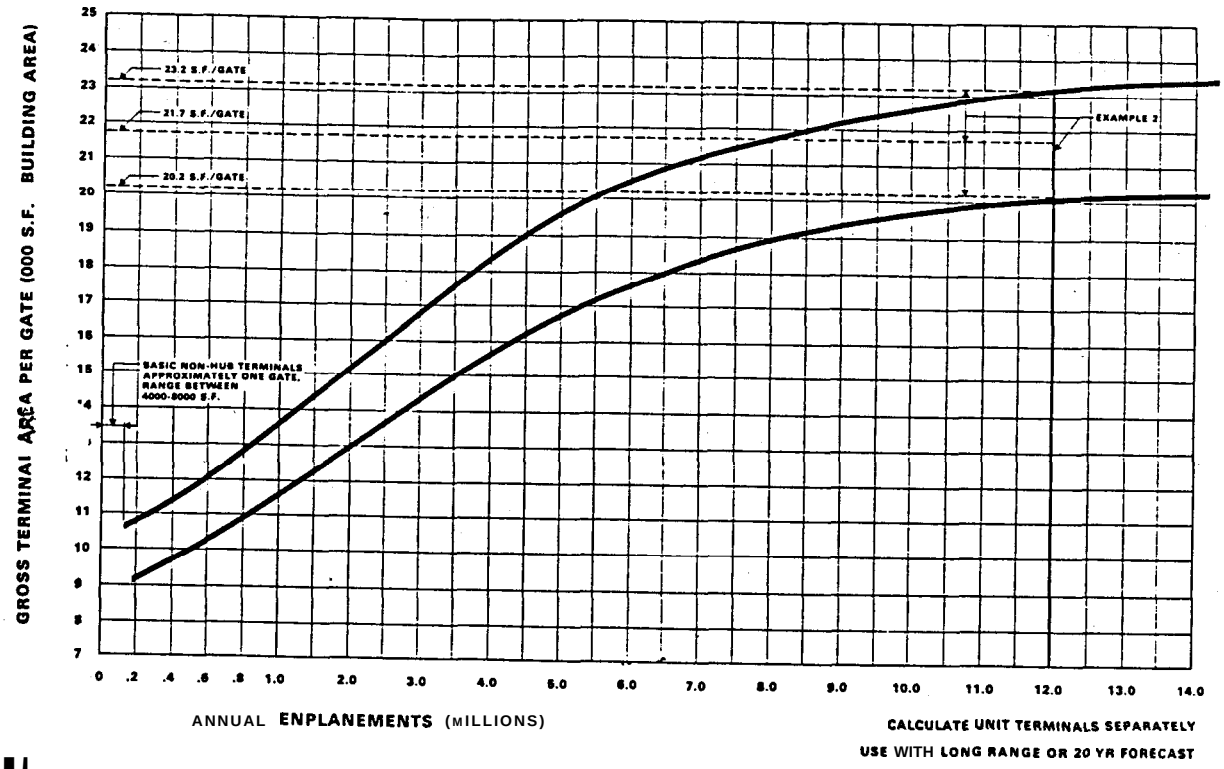


Figure 5-2. Gross Terminal Area Per Gate – Long-Range Planning

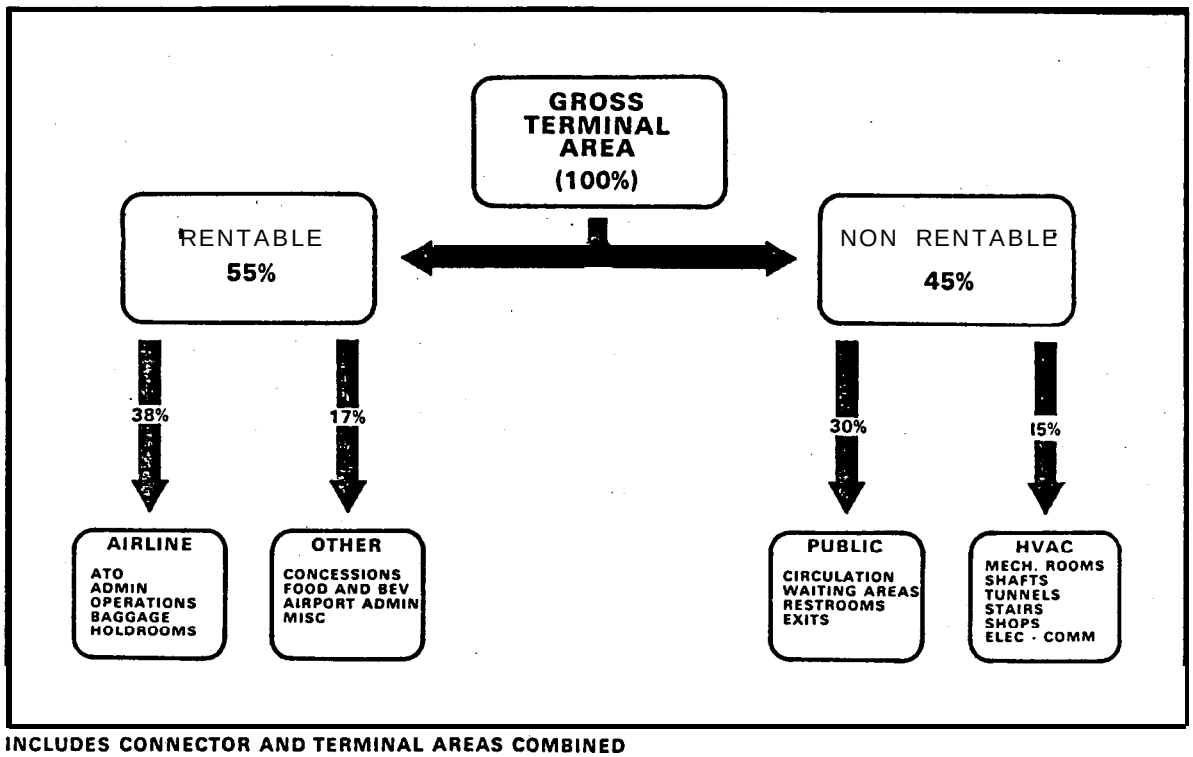


Figure 5-3. Gross Terminal Area Space Distribution

(3) Figure 5-4 contains a nomograph for approximating ticket lobby area for initial planning purposes. This nomograph includes the ticket counter and area behind the ticket counter as part of the lobby area. It is necessary to subtract the counter area when estimating only the public lobby area used for passenger queuing and circulation. Inventories at some existing large hubs indicate that additional area to that shown in the figure should be provided at the extreme ends of the ticket counters for additional circulation.

b. Waiting Lobby.

(1) Apart from providing for passenger and visitor circulation, a centralized waiting area usually provides public seating and access to passenger amenities, including rest rooms, retail shops, food service, etc. The sizing of a central waiting lobby is influenced by the number, seating capacity, and location of individual gate waiting areas. If all gate areas have seating, the central waiting lobby may be sized to seat 15 to 25 percent of the design peak hour enplaning passengers plus visitors. However, if no gate seating areas are provided or planned, seating for 60 to 70 percent of design peak hour enplanements plus visitors should be provided.

(2) Visitor-passenger ratios are best determined by means of local surveys. In the absence of such data, an assumption of one visitor per peak hour originating passenger is reasonable for planning purposes.

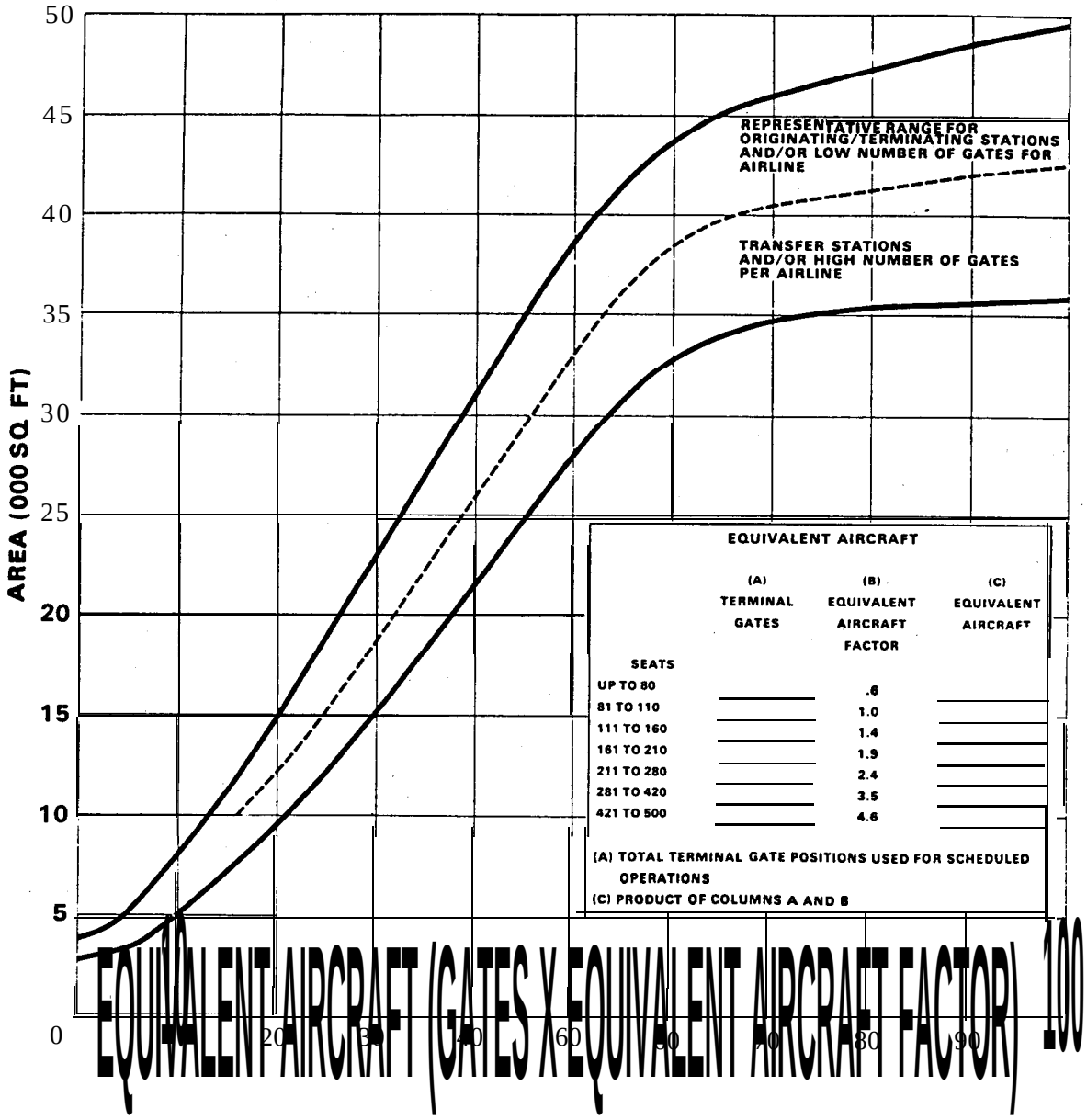


Figure 5-4. Ticket Lobby and Counter Area

(3) Figure 5-5 may be used as an approximation for converting seating requirements to lobby area. The area obtained from this nomograph provides for circulation around two sides of seating. Additional area is required for circulation around three sides.

c. Baggage Claim Lobby.

(1) This lobby provides public circulation space for access to baggage claim facilities and for egress from the claim area to the deplaning curb and ground transportation. It also furnishes space for such passenger amenities and services as car rental counters, telephones, rest rooms, limousine service, etc.

(2) Space required for the baggage claim facility is discussed in paragraph 75. Allowance for public circulation and passenger amenities outside the claim area ranges from 15 to 20 feet (5 to 6 m) in depth at

small hub airports,. 20 to 30 feet (6 to 9 m) at medium hubs, and 30 to 35 feet (9 to 11 m) at those airports serving large hubs. Lobby lengths range from 50 to 75 feet (15 to 23 m) for each baggage claim device. For approximating lobby length and area, one claim device per 100 to 125 feet (30 to 38 m) of baggage claim frontage should be assumed.

d. Combined Lobbies.

(1) Airports handling less than 100,000 annual enplanements frequently provide a single combined lobby for ticketing, waiting, and baggage claim. Figure 5-5, with an assumed seating for 100 percent of peak hour enplanements, may be used to obtain a gross approximation for lobby space. This usually allows adequate space for visitors and circulation. Also, AC 150/5360-9 presents space requirements for low activity airports.

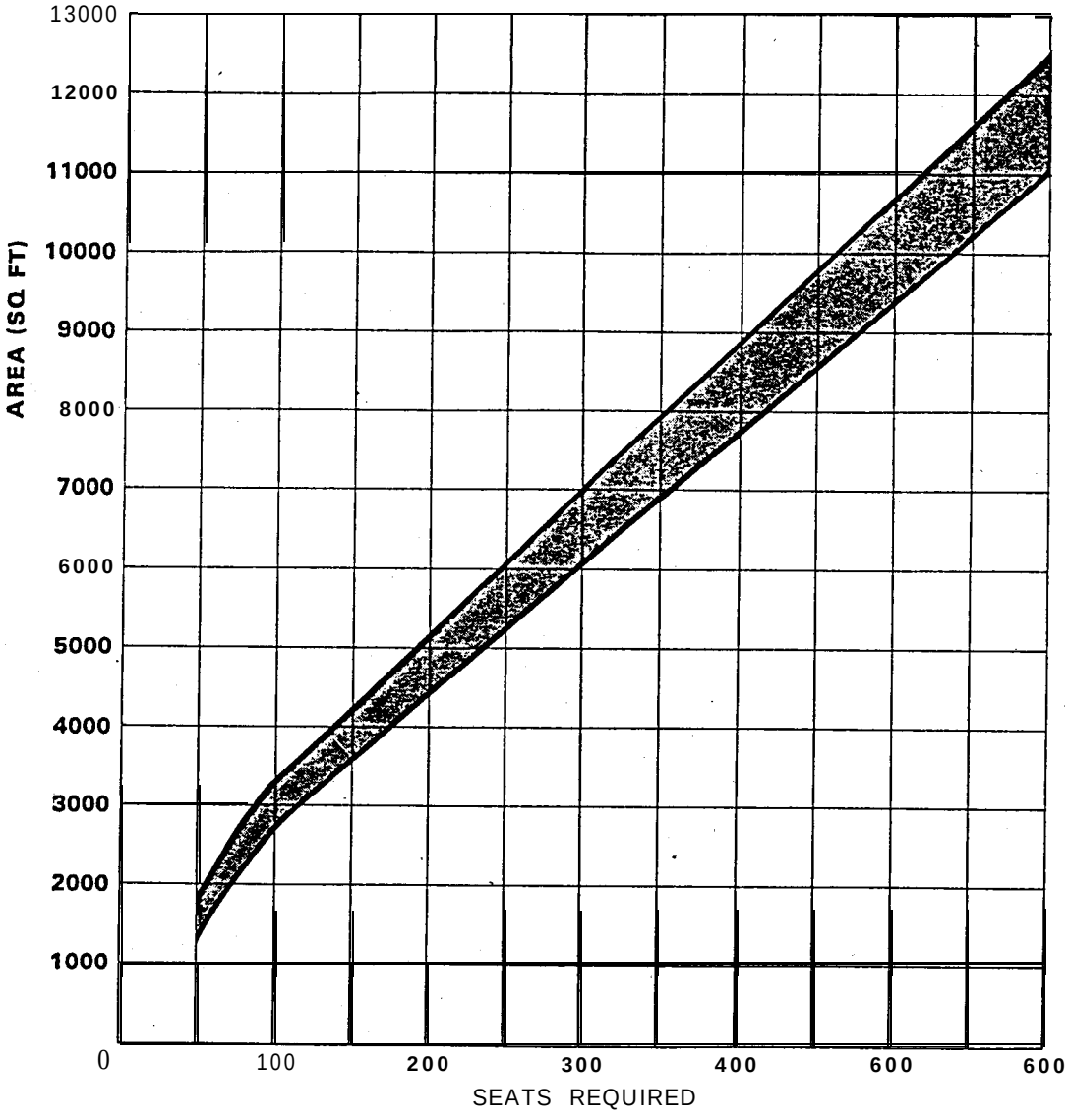


Figure 5-5. Waiting Lobby Area

For a combined lobby serving 100,000 to 200,000 annual enplanements, space requirements for various functions should be identified and sized separately, as discussed in preceding paragraphs.

(3) Above 200,000 annual enplanements, each of the three lobby types should be identifiable as distinct elements and space requirements estimated accordingly.

70. AIRLINE TICKET COUNTER/OFFICES. The Airline Ticket Counter (ATO) area is the primary location for passengers to complete ticket transactions and check-in baggage. It includes the airline counters, space and/or conveyors for handling outbound baggage, counter agent service areas, and related administrative/support offices. In almost all cases, ticket counter areas are leased by an airline for its exclusive use. Therefore, the planning, design, and sizing of these areas should be closely coordinated with individual airlines.

a. Ticket Counter Configurations. Three ticket counter configurations are in general use. They include:

(1) Linear. Linear configuration is the most frequently used one (see Figure 5-6). Multi-purpose positions indicated are those in which the agent performs several functions such as ticketing, baggage check-in, and the other services an airline may consider appropriate. During peak periods, multi-purpose positions may be utilized for a single function to expedite passenger processing for those requiring only one type of service. At high volume airports, permanent special-purpose positions may be justified.

(2) Flow-through Counters. Flow-through counters, as depicted in Figure 5-7, are used by some airlines, particularly at high-volume locations with a relatively high percentage of "baggage only" transactions. This configuration permits the passenger to check-in baggage before completing ticketing transaction and increases outbound baggage handling capability by providing additional belt conveyors. This type of counter requires more floor space, an additional 50-70 square feet (4.7-5.1 m^2), than the linear type and involves increased investment and maintenance costs. Future application will probably be limited to relatively few airports.

(3) Island Counters. The island counter shown in Figure 5-8 combines some features of the flow-through and linear arrangements. The agent positions form a "U" around a single baggage conveyor belt (or pair of belts) permitting interchangeability between multipurpose or specialized positions. As with flow-through counters, this configuration has relatively limited application.

b. Office Support. The airline ticket counter/office provides space for a number of airline support activities. These activities include: accounting and safekeeping of receipts; agent supervision; communications; information display equipment; and personnel areas for rest, personal grooming, and training. At low activity locations, the ticket counter area may provide space for all company administrative and operational functions, including outbound baggage. Figure 5-9 depicts two typical layouts for low activity airports with single-level terminals. At high activity locations, there is more likelihood that additional space for airline support activities will be remotely located from the ticket counters.

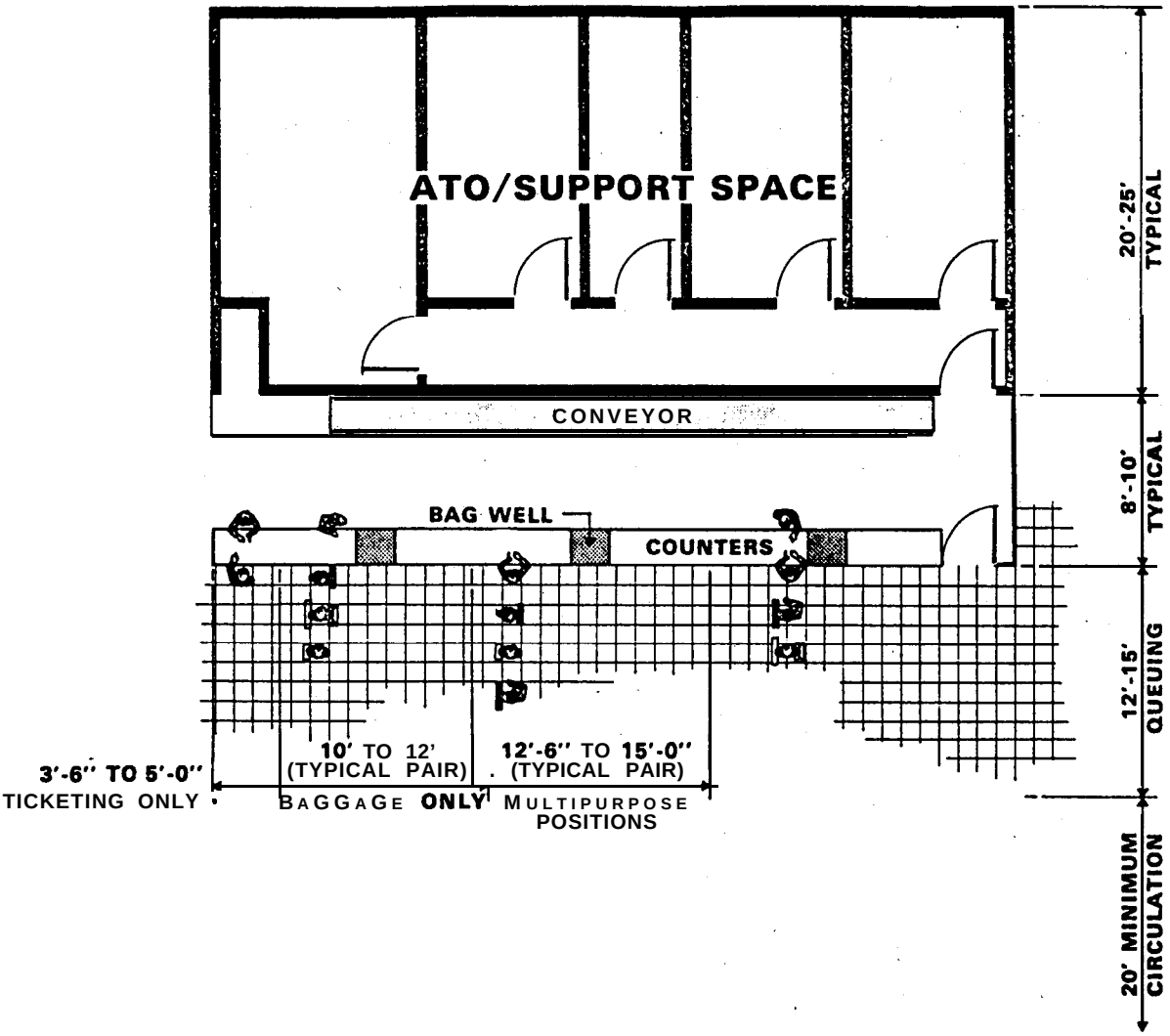


Figure 5-6. Linear Counter

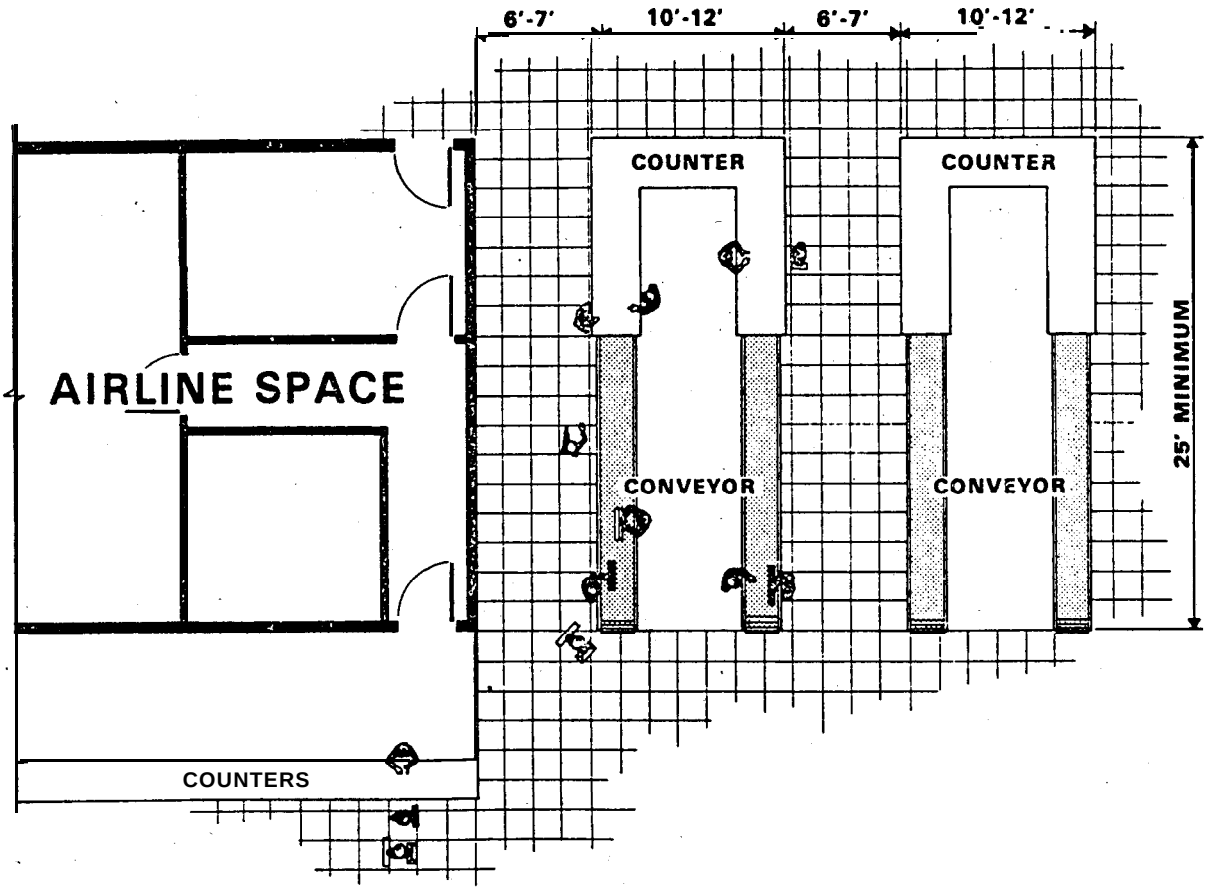


Figure 5-7. Flow-Through Counter

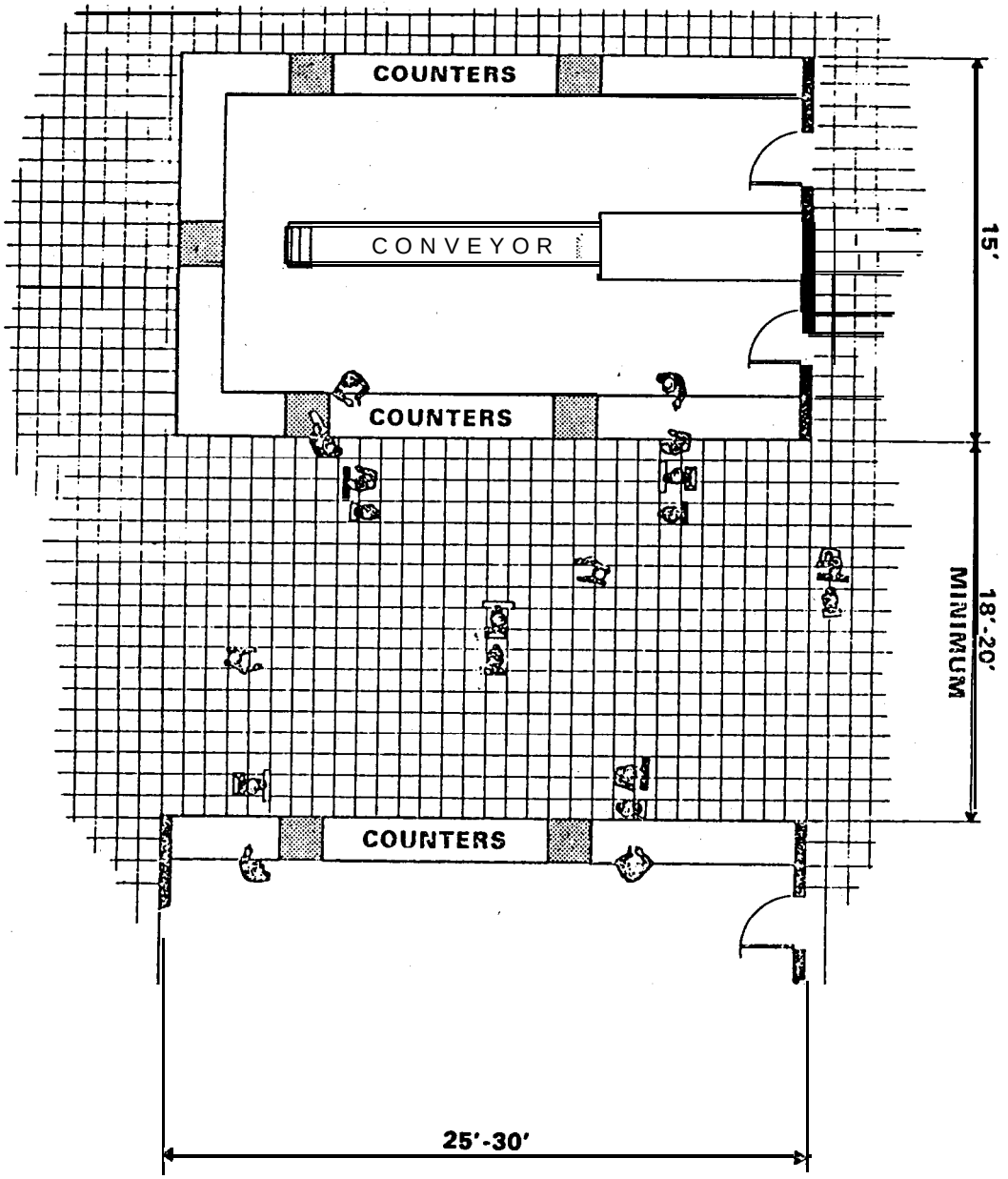


Figure 5-8. Island Counter

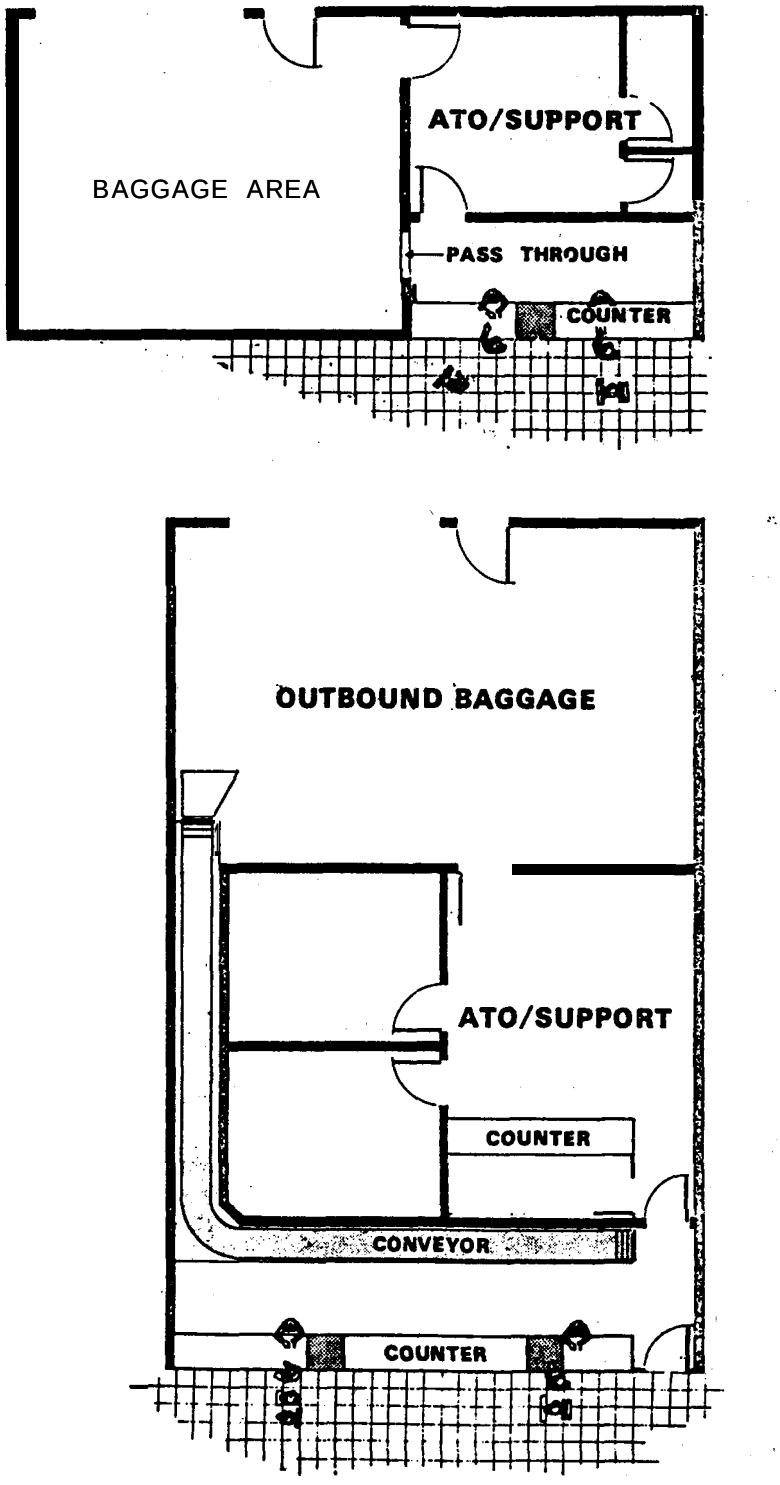


Figure 5-9. Typical AT0 Layouts – Single-:Level Terminals

c. **Sizing.** Figure 5-10 may be used in estimating airline ticket counter frontage for the three counter configurations previously discussed. It utilizes the EQA factors discussed in paragraph 25,. The frontage obtained from the chart is based on counter positions typically required for airline peaking activities. The values determined from the chart do not include conveyor belt frontage at flow-through counter configurations. Less frontage may be required when individual airlines provide curb check-in and ticketing at gates: In determining the counter working area, the frontage obtained from the chart is multiplied by a depth of 10 feet (3 m). Figure 5-l 1 shows typical ranges of AT0 support space. This is presented separately from counter working area since many of these support functions are remotely located at higher activity locations. For gate or gate equivalents exceeding those shown in this figure, quantities appropriate to the separate lobbies 'or sections of lobbies, unit terminals, and the like, should be used. This normally occurs at airports with over 50 gates.

71. OUTBOUND BAGGAGE FACILITIES.

a. The outbound baggage facility is that area where baggage is received by mechanical conveyor from the ticket counters, online and offline connecting flights, and curb-side check-in. It is sorted and loaded into containers or carts for subsequent delivery to aircraft. At low-volume airports, bags may be manually moved through a wall opening.

b. At most airports, outbound baggage areas are located in building spaces leased by the tenant airlines for exclusive use. Each airline provides its own baggage processing equipment and conveyors. The outbound baggage area should be located in -reasonably close proximity to the ticket counters to facilitate the movement of baggage between these locations. The area should also have convenient access to the aircraft parking apron by means of carts or other mobile or mechanical conveyors.

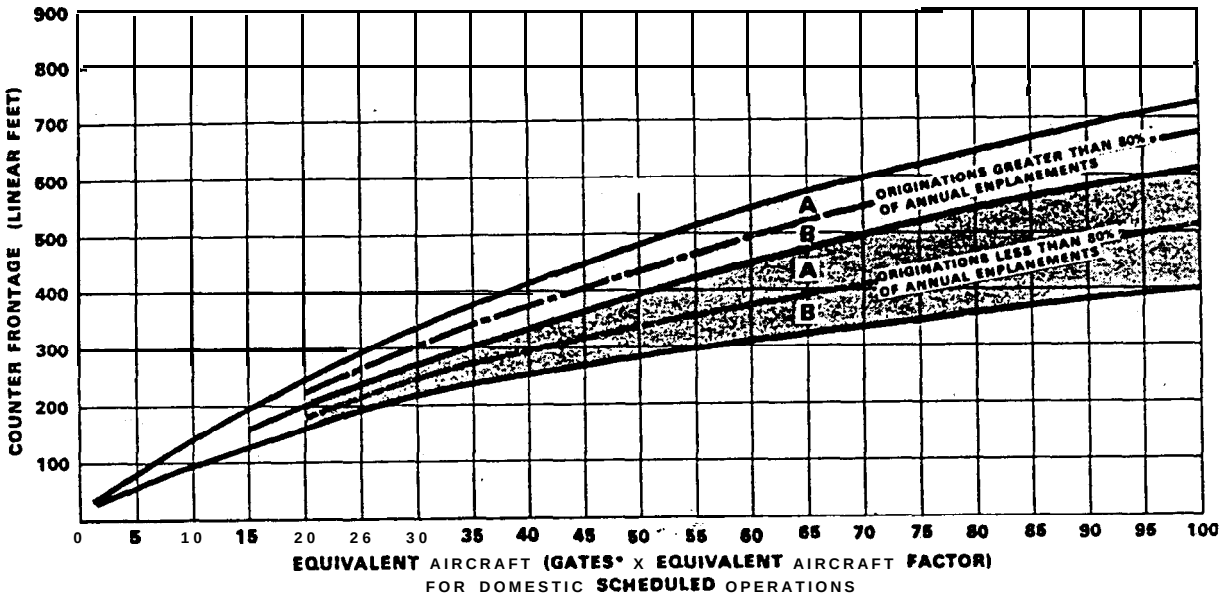
c. On-line and inter-line transfer baggage is best handled in the same area with other outbound baggage for optimal use of personnel, space, and equipment. An area or conveyor for receiving transfer baggage from other airlines should be considered. Often, this area is adjacent to a primary traffic aisle. Security for delivered baggage makes a conveyor or pass-through into the outbound baggage area advisable. At stations where the airlines contract with a third party for all interline deliveries, a pick-up area for baggage to be delivered to other carriers should be provided with similar provisions for baggage security and control.

d. Since outbound baggage area requirements are determined by individual airline policy, early input from the airlines is essential. The minimum size for an outbound baggage room is approximately 400 to 450 sq. ft. (37 to 42 m^2) per airline. Figures 5-12 and 5-13 can be used for initial estimating of outbound baggage area requirements. These nomographs were developed on the basis of an average of 1.3 bags checked per passenger. Caution should be used in applying these nomographs as 'substantial variance in the number of bags per passenger at different airports can range from 0.8 to 2.2. Business passengers will usually average less than 1.3, whereas vacationers needs may be substantially greater.

e. At locations where an airline proposes using some type of automated sorting, additional area to that indicated in Figure 5-13 will be necessary. The required area should be increased by at least 150 to 200 percent for tilt-tray sorting systems and 100 percent for destination-coded vehicle systems.

f. Following are some common types of outbound baggage equipment:

(l) Belt conveyors represent the most commonly used mechanized component for baggage systems, operating at speeds of 80 to 150 fpm (25 to 46 mpm) over short distances, and providing transport capacities of 26 to 50 bags per minute.



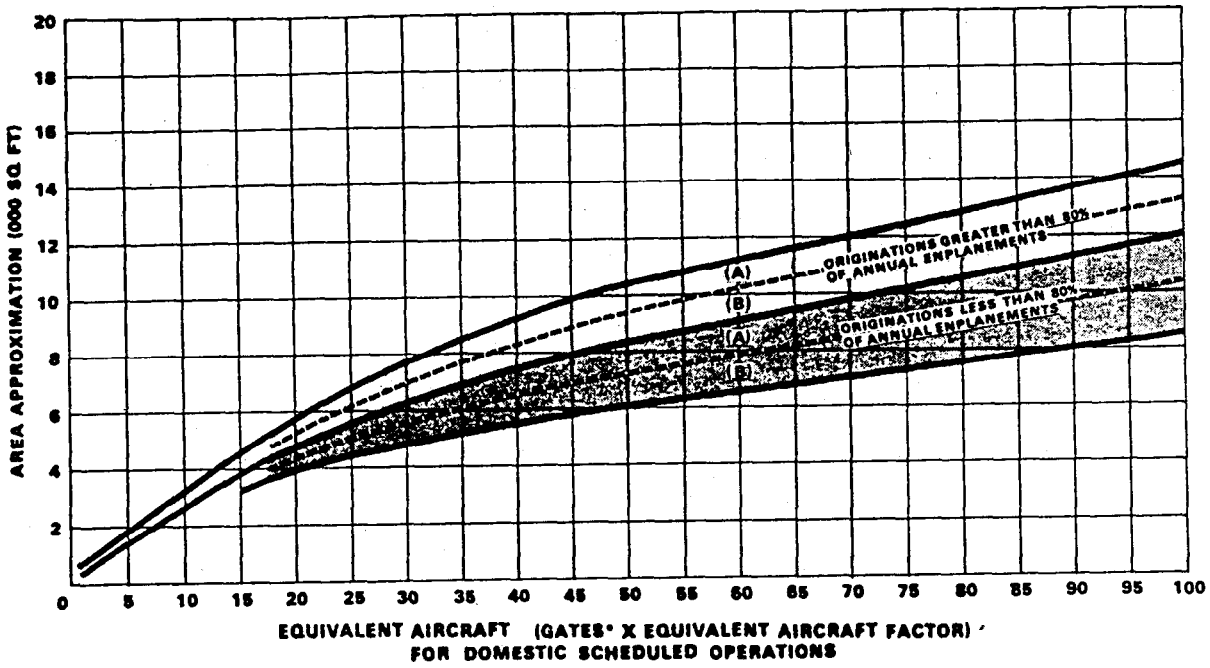
	EQUIVALENT AIRCRAFT		
	(A) TERMINAL GATES	(B) EQUIVALENT AIRCRAFT FACTOR	(C) EQUIVALENT AIRCRAFT
SEATS			
UP TO 80		.8	
81 TO 110		1.0	
111 TO 160		1.4	
161 TO 210		1.8	
211 TO 280		2.4	
281 TO 420		3.6	
421 TO 500		4.6	

(A) TOTAL TERMINAL GATE POSITIONS USED FOR SCHEDULED OPERATIONS
(C) PRODUCT OF COLUMNS A AND B

(A) TYPICAL WHERE PEAK HOUR GATE UTILIZATION HAS HIGH PERCENTAGE OF DEPARTURES (EQUAL OR GREATER THAN 80% OF EQUIVALENT AIRCRAFT).

(B) TYPICAL WHERE PEAK HOUR GATE UTILIZATION COMBINES ARRIVALS AND DEPARTURES (DEPARTURES LESS THAN 80% OF EQUIVALENT AIRCRAFT).

Figure S-10. Terminal Counter Frontage



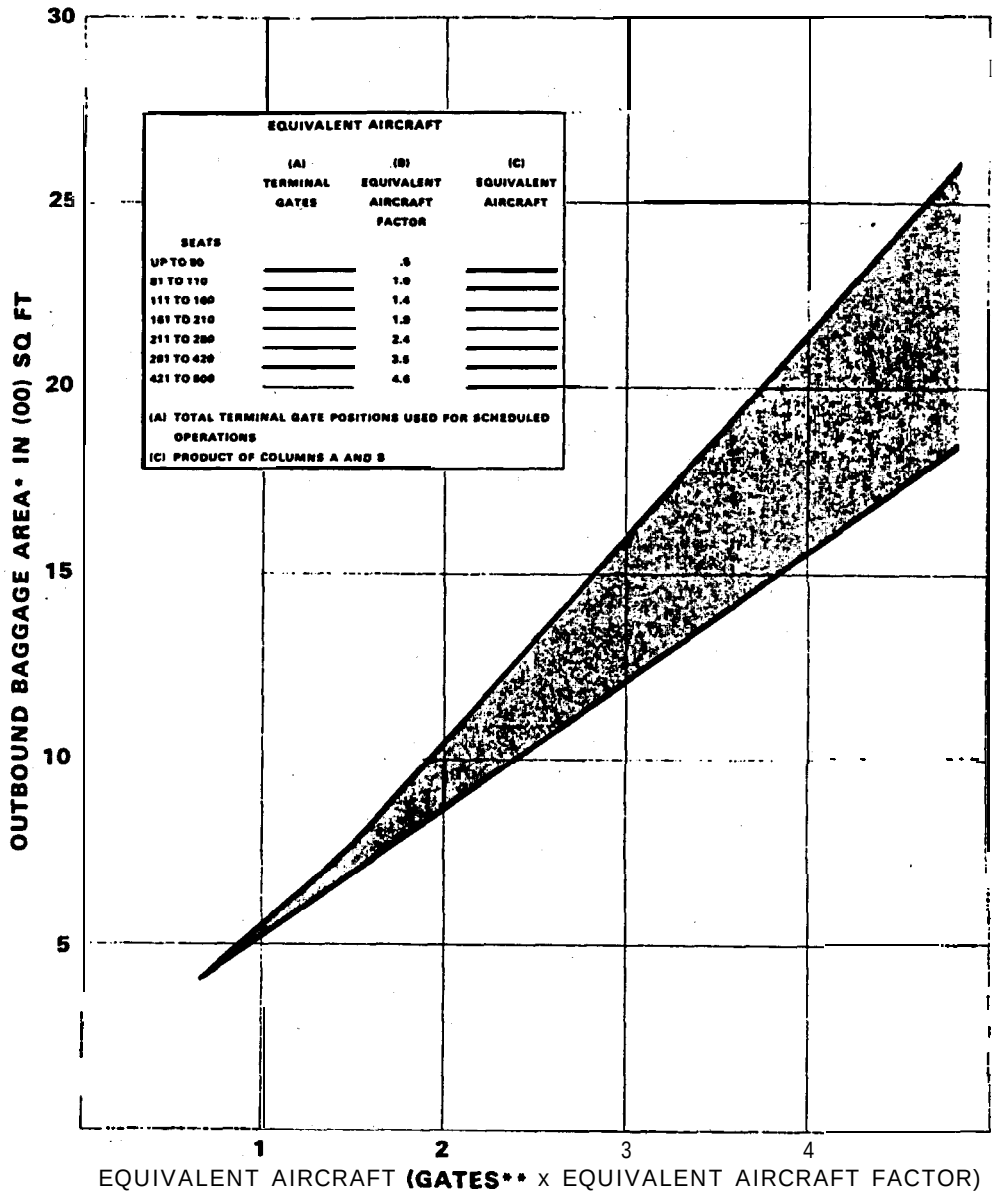
EQUIVALENT AIRCRAFT			
SEATS	(A) TERMINAL GATES	(B) EQUIVALENT AIRCRAFT FACTOR	(C) EQUIVALENT AIRCRAFT
UP TO 80		.6	
81 TO 110		1.0	
111 TO 160		1.4	
161 TO 210		1.9	
211 TO 280		2.4	
281 TO 420		3.5	
421 TO 600		4.6	

(A) TOTAL TERMINAL GATE POSITIONS USED FOR SCHEDULED OPERATIONS
(C) PRODUCT OF COLUMNS A AND B

(A) TYPICAL WHERE PEAK HOUR GATE UTILIZATION WAS HIGH PERCENTAGE OF DEPARTURES (EQUAL OR GREATER THAN 80% OF EQUIVALENT AIRCRAFT).

(B) TYPICAL WHERE PEAK HOUR GATE UTILIZATION COMBINES ARRIVALS AND DEPARTURES (DEPARTURES LESS THAN 80% OF EQUIVALENT AIRCRAFT).

Figure 5-11. AT0 Office and Support Space



* INCLUDING CART SPACE, BAGGAGE HANDLING EQUIPMENT, SORTING AISLES AROUND EQUIPMENT AND CARTS, AND TRAFFIC LANES

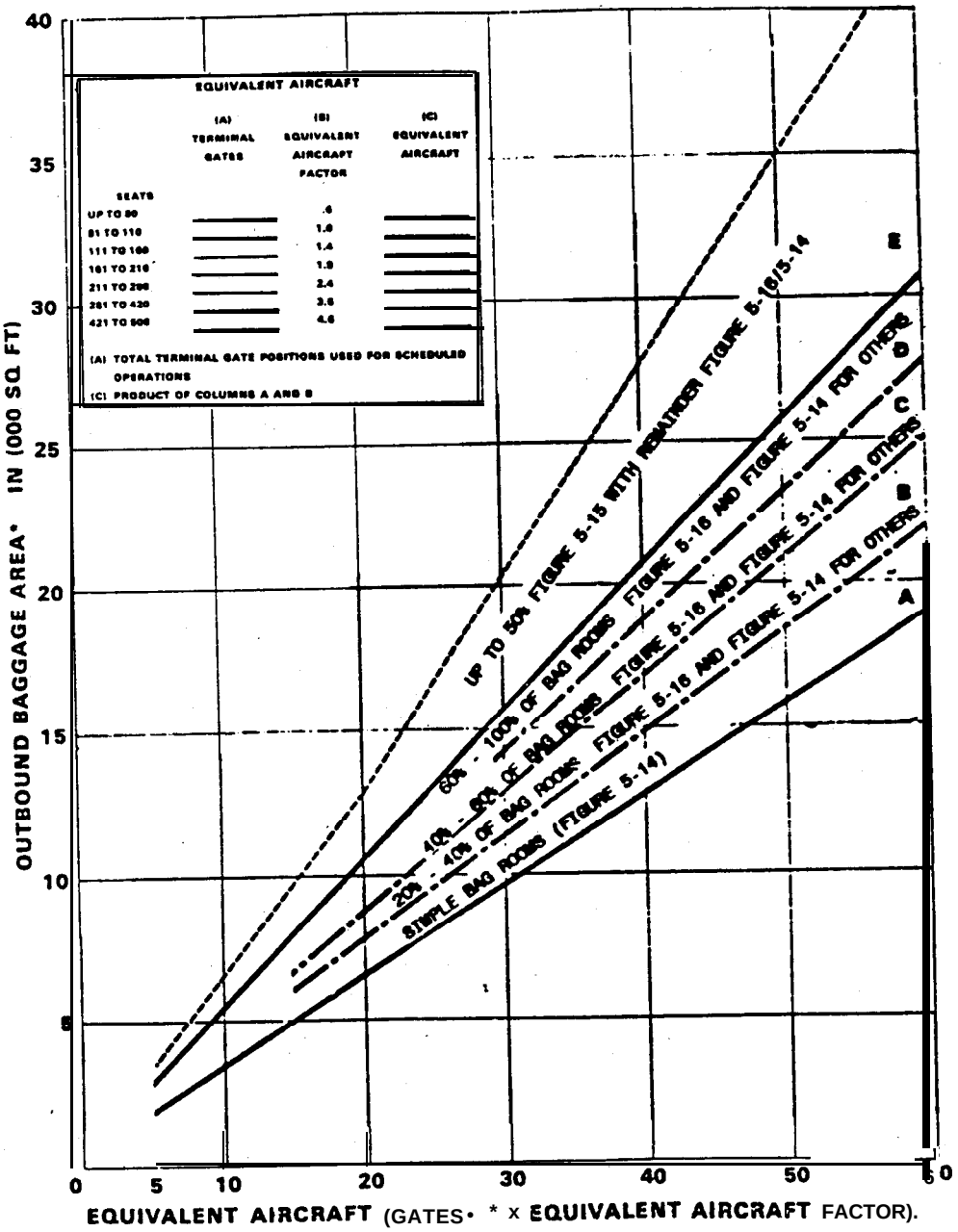
EXCLUDES JOINT USE TUG DRIVE

MINIMUM SPACE REQUIREMENT @ 400 SQ FT

** ACTIVE LOADING POSITIONS

BASED ON 1.3 AVERAGE BAGS PER PASSENGER.

Figure 5-12. Outbound Baggage Area -- Less Than Five EQA



*INCLUDING CART AND BAGGAGE HANDLING OR SORTING EQUIPMENT, SORTING AISLES AROUND EQUIPMENT AND CARTS, AND TRAFFIC LANES. EXCLUDES JOINT USE TUG DRIVE

**ACTIVE LOADING POSITIONS

BASED ON 1.3 AVERAGE BAGS PER PASSENGER.

Figure 5-13. Outbound Baggage Area - Five or More EQA

(a) Raw belt conveyors with spill plates (Figure 5- 14) tend to become less efficient as the length of unloading section is increased to process simultaneous departures. In such cases, bags not removed by the baggage handler at his normal working position must be retrieved later from the end of the spill plate. That end becomes progressively more distant as the number of flights and size of aircraft increase. This condition may bc alleviated somcwhnt by using belt conveyors with indexing features activated by photoelectric switches.

(b) Belt conveyor capacities can be incrcnscd by adding conveyors between counter inputs and outbound baggage rooms or, marginally, by merging multiple input conveyors into a higher-speed mainline conveyor. Long segments may operate at speeds up to 300 fpm (90 mpm), with acceleration and deceleration belts at each end. This represents a practical maximum for current technology and maintenance. Accordingly, high-speed belts are primarily used to reduce transport times for long conveyor runs and seldom, if ever, increase system capacity.

(2) Inclined belts, vertical lift devices, or chutes are used with baggage rooms located on a different floor level from the ATO counters. Chutes arc the least cxpcnsivc but lack the mcnns for controlling baggage 'movement and increase the potential for damaged bags. Inclined belts should not exceed a 22-degree slope and are usually designed for 90 to 100 fpm (28 to 31 mpm) maximum. Vertical lift devices arc available with capacitiesof 18 to 45 bags per minute.

(3) Recirculating devices for sorting and loading baggage arc normally considered when the number of departures processed concurrently excccdsthe practical capabilitiesof a raw belt and spill plate. Equipment types include belt conveyors utilizing straight and curved segments, flat-bed devices, or sloping-bed plates devices. Each of these may be fed by more than one input conveyor and may require indexing belts and accumulators to control input flow. The recirculating feature facilitates sorting bags into carts for more flights and larger aircraft by fixing rclntivcly stationary work positions for baggage handlers with "dynamic storage" of bags until they can be sorted into carts or containers.

(4) Elongated oval configurations tend to be used in lieu of circular devices as the number of carts increases. Figure 5-15 shows carts and container dollies pnrkcd parallel to a bolt-loop or flat-bed sorting device. Figure 5-16 shows the same carts parked at right nnglcs to a sloping-bed device. The sloping bed may accommodate two rows of bags to increase overall storage capacity. This can offset the reduction in perimeter frontage from that afforded with parallel parking. Although right-angle parking can reduce floor space by 30 to 50 percent, some carriers prefer parallel parking to minimize time and manpower for maneuvering and positioning of carts. In either case, the input conveyors need to be elevated to permit passage of carts and contnincrs within the space.

(5) Semiautomated sorting utilizes mechanical equipment to move bags onto a lateral slide or conveyor designated for concurrently processing separate dcparturcs. Figure 5-17 shows a linear belt sorter capable of handling about 30 bags per minute, usually when the maximum number of dcpnrtures processed concurrently does not exceed 12 to 15. The operator dcsignntcs the appropriate lateral after reading the tag on each passing bag. A separate sorter is needed for each input conveyor line from the ATO.

(6) Tilt-tray sorters, as shown in Figure S-18, are considered appropriate for very high volume stations requiring multiple inputs and greater capncitics than possible with the preceding types. These systems are custom designed with relatively sophisticated coding and sorting features as well as lateral conveyors accumulating baggage for each departing flight. Terminal designs should allow the flexibility for future installation of such systems.

(7) Destination-coded vehicle systems (Figure 5-19) represent highly advanced technological proposals for handling the higher volumes, longer distances, interline transfers, and elevation changes encountered in terminals serving large hubs. Although the vehicles and propulsion methods vary, all have similar design criteria. These are: speeds up to 880 ft/min (268 m/min); elevation change capability (up to 33 degrees); fixed rights-of-way; programmable control systems and vehicle encoding; and interface with load/unload stations.

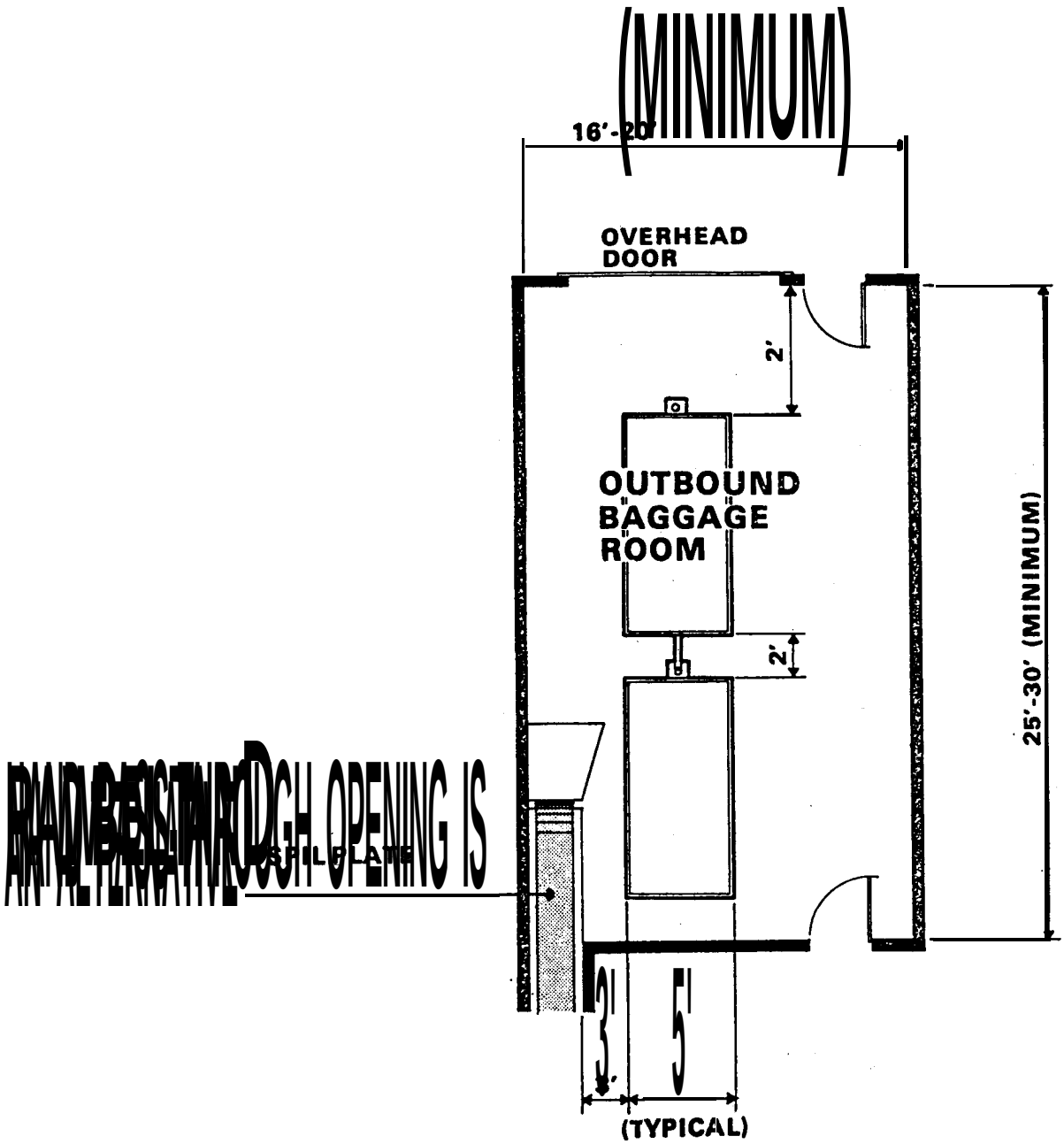


Figure 5-14. Outbound Baggage Room Typical Raw Belt Conveyor Installation

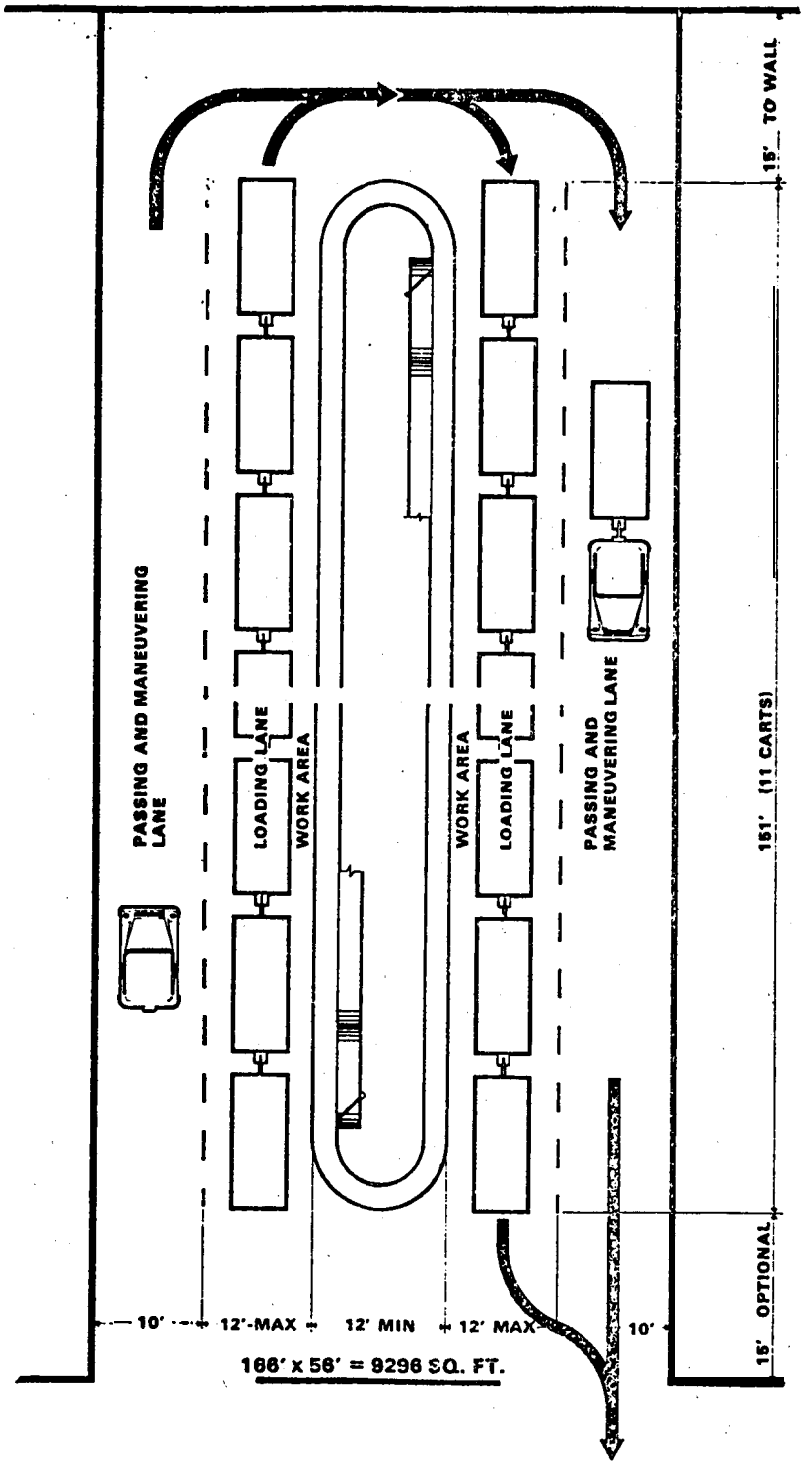


Figure 5-15. Outbound Bagga Recirculating Belt - Parallel Parking

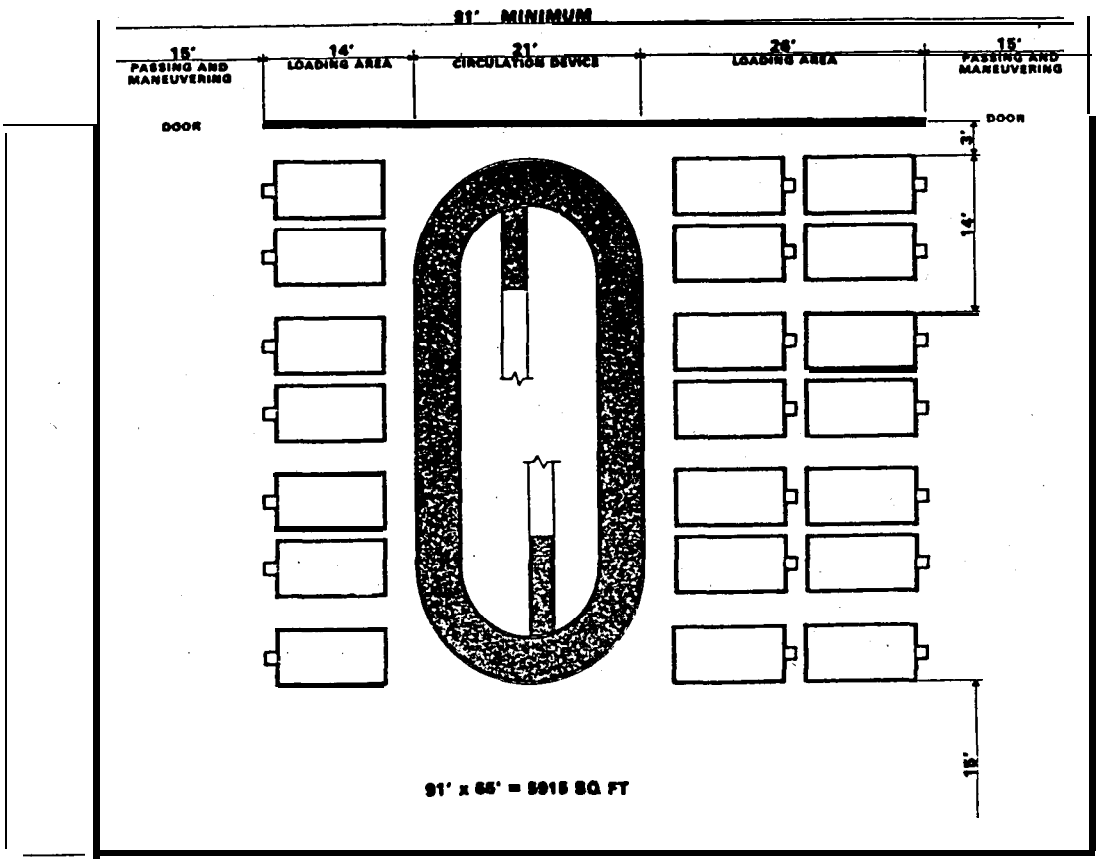


Figure 5-16. Outbound Baggage Recirculating Sloping Bed – Perpendicular Parking

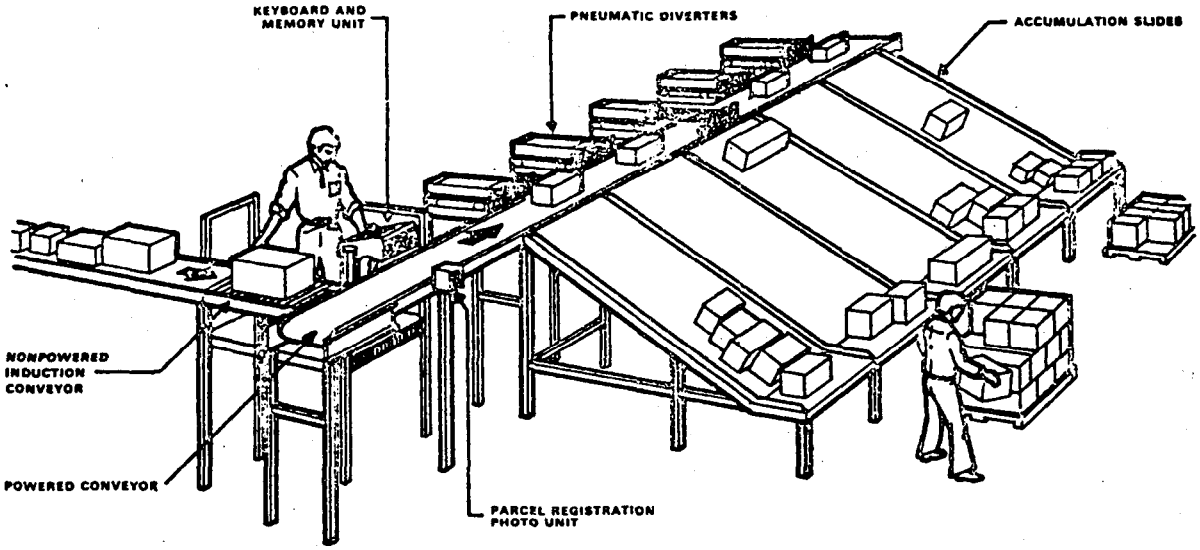
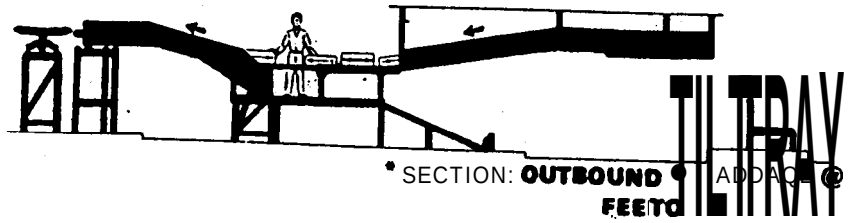
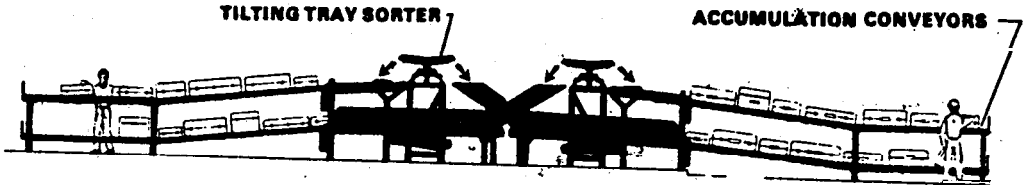


Figure 5-17. Semiautomated Linear Belt Sorter





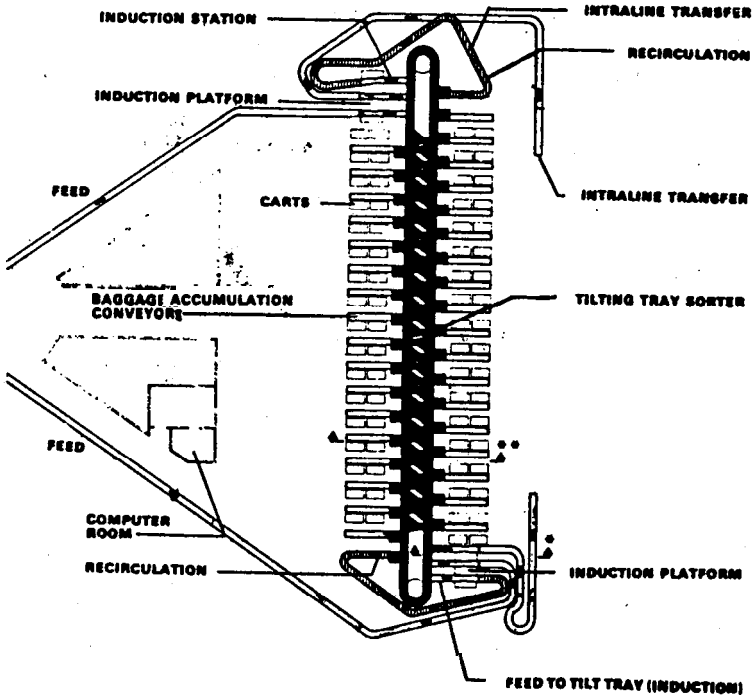


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Figure 5-18. Tilt-Tray Sorter

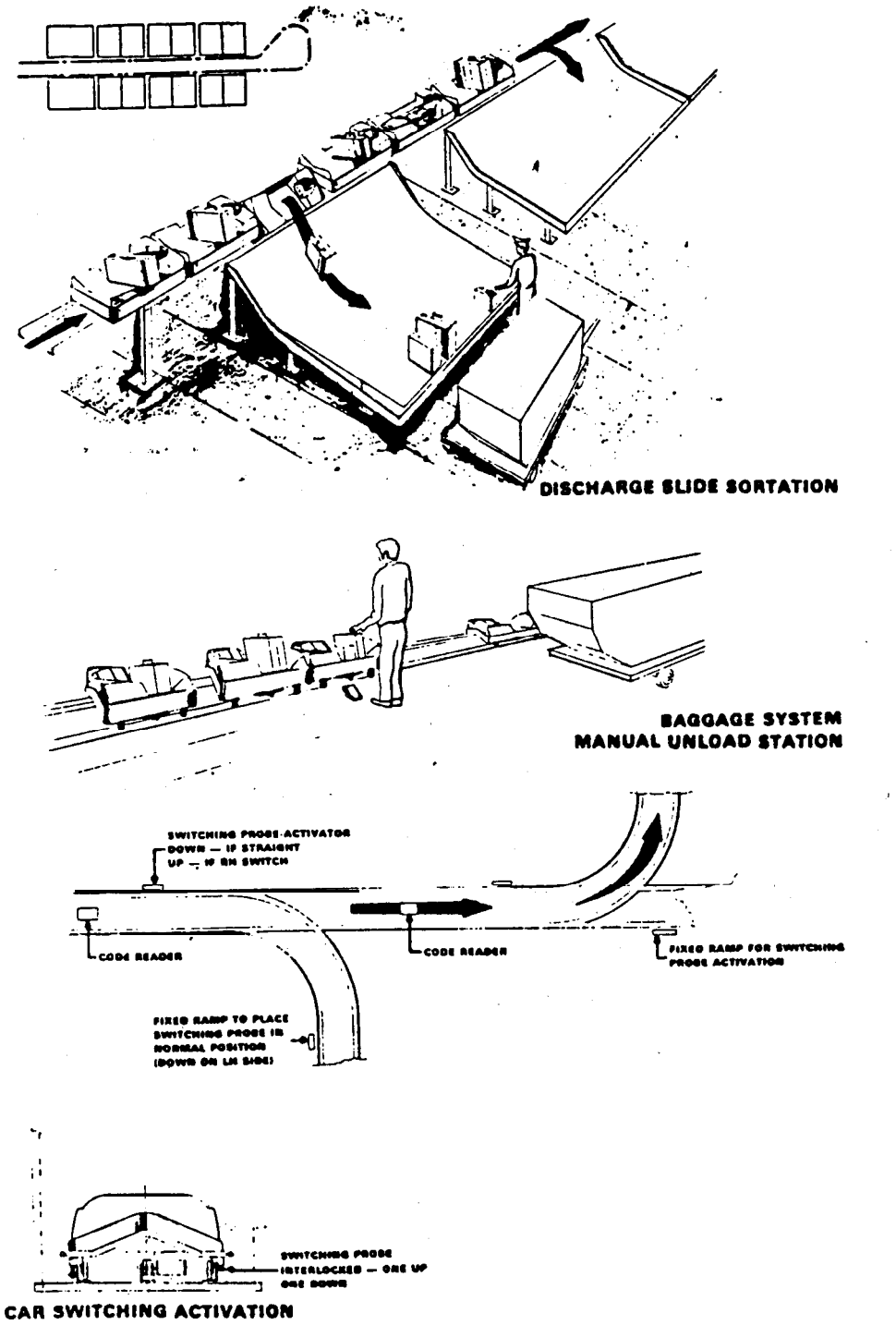


Figure 5-19. Destination-Coded Vehicle

g. Table 5-l relates enplanement criteria and outbound baggage equipment.

Table 5-1. Recommended Selection Criteria Outbound Baggage Equipment

System type	Application Range Peak Hour Enplanements[1] Average Day/Peak Month	Reference Figure No.
Manual (pass-through or raw belt with spill plate)	up to 200	5-14
Recirculationdevices, accumulators, and indexing belts	150 to 1,500	5-15, 5-16
Linear belt sorter	300 to 800	5-17
Tilt-tray sorter	800 to 5,000+	5-18

[1] For one or more airlines sharing a single system.

h. Some noteworthy building design features in the outbound baggage area arc provided below:

(1) Aisles at least 3 feet (1 m) wide are usually required around baggage sorting device and between pairs of carts parked at right angles (unless carts only open on one side).

(2) Traffic lanes for cart trains normally require 10 feet (3 m) with provisions for a 21 foot (6.5 m) outside radius at turns. Variations are such that airlines should bc consulted.

(3) Vehicular door locations relative to the apron or restrictions in the number of such doors may necessitate additional space to manually maneuvercarts or dollies.

(4) Column spacingsarc particularlycritical and should be reviewedwith airlines early in the planningstage.

(5) Minimum clear heights of 8 to 8.5 feet (2.4 to 2.6 m) are required by most airlines for containerson dollies for use with wide-body aircraft, although a 10 foot (3 m) clearance is often recommended.

(6) Since airline tugs/tractors have internal combustion engines, local code regulations and Federal standards for mechanicalventilation of enclosed areas should receive attention early in the planning/designprocess.

i. Trends in future outbound baggage handling systems include:.

(1) Computerized automated systems with hourly throughputs to 3,000 bags per hour. Sorting error, other than human error, is expected to be reduced to 1 percent. Baggage is sorted by barcode tags read by a laser scanner.

(2) Large underground baggage handling facilities. These facilities will usually be located under aprons areas in order to provide the very large space needed by the baggage handling facility.

72. PUBLIC CORRIDORS.

a. Corridors are provided for public circulationbetwcen aircraft boarding gates and various lobbies and other areas within the terminal building. The effective corridor design width is the total width less obstacles (e.g., telephones, wastebaskets, benches, protruding displays, etc.) with a minimum clcaranceof approximately2 feet (0.6 m) on each side. This clearance is providedbecausc of the phenomenonknown as "boundary layer" in which a person will normally maintain such a clearance between corridor, walls and obstacles. Viewing areas for video displays and passengerqucue areas extendinginto the corridor should also bc treated as obstacles in design width determinations.

b. Figure 5-20 illustrates an effective corridor design width. The design width is determinedby dividing the peak corridor population per minute (visitors and passengers) by the corridor width capacity factor expressed in people per unit width per minute. Table 5-2 provides a corridor capacity matrix based on an average walk rate of 242 feet (74 m) per minute. For example, the bottom line of Table 5-2 indicates a capacity of 330 to 494 persons

per minute for a corridor with a 20 foot (6 m) effective design width, for a pedestrian occupancy width of 2.5 feet (.76 m) and depth separation ranging from 4 to 6 feet (1.2 to 1.8 m). While a relatively abrupt introduction of deplaning passengers into a corridor may retard the walk rate, it will be offset somewhat by a decrease in their depth separation. A congregation of people awaiting the arrival of passengers may also retard the flow rate. This capacity reduction is usually only brief and local in nature and does not ultimately affect the overall corridor design capacity. This congestion can be minimized by providing areas for flow surge and greeters in the corridor width.

Table 5-2. Corridor Capacity in Persons Per Foot (.305 m) Width Per Minute

Width Occupancy Ft (m)	Depth Separation - Ft (m)				
	4.0 (1.20)	4.5 (1.35)	5.0 (1.50)	5.5 (1.65)	6.0 (1.80)
2.00 (.61)	30.9	27.5	24.7	22.5	20.6
2.25 (.69)	27.4	24.4	22.0	20.0	18.3
2.50 (.76)	24.7	22.0	19.8	18.0	16.5

73. SECURITY INSPECTION STATIONS.

a. Air carriers using over 60 passengcr scat aircraft in scheduled or public charter operations are required by Federal Aviation Regulations (FAR) 121.538 to screen all passengers prior to boarding in accordance with the provisions of FAR Part 108. This activity is normally handled inside the terminal building at a security screening station.

b. There are three types of passengcr inspection stations, depending on the location of the station in relation to the aircraft boarding area. Thcsc include:

(1) Boarding Gate Station;

(2) Holding Area Station: and

(3) Sterile Concourse Station.

c. A sterile concourse station, from both the standpoint of passenger security facilitation and economics, is the most desirable type of screening station. It is generally located in a concourse or corridor leading to one or several pier finger(s) or satellite terminal(s) and permits the screening and control of all passengers and visitors passing beyond the screening location. It thus can control a considerable number of aircraft gates with a minimum amount of inspection equipment and pcrsonncl. Pier and satellite terminal concepts arc well suited for application of the Stcrilc Concourse Station, since the single-point entrance connector element facilitates isolation of boarding areas.

d. Becauseof building geometry, especially that associatedwith lincarand transporter terminal concepts, the Sterile Concourse Station is not always fcasiblc. Under these circumstances, several inspection stations may be required to control a number of holding areas or departure lounges. In the worst situation, a screening station may be required at each boarding gate.

e. Except at low activity airports, where manual search procedures may be cmployed, a security inspection station will generally include a minimum of one walk-through weapons detector and onc'x-ray device. Such a station has a capacity of 500 to 600 persons per hour and requires an area ranging from 100 to 150 square feet (9 to 14 sq.m). Examples of security inspection station layouts arc illustrated in Figure 5-21.

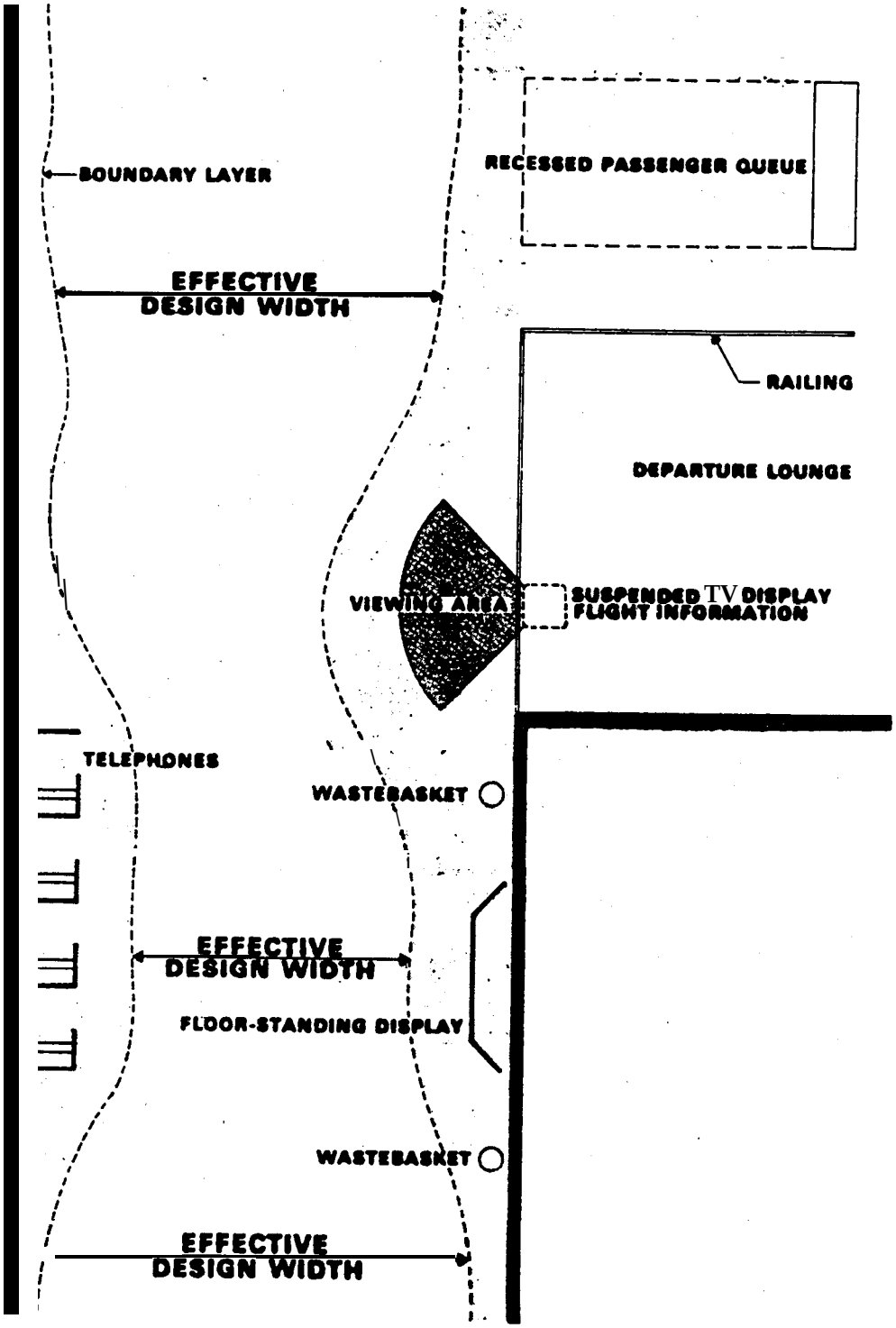


Figure S-20. Public Corridor Effective Desip Width

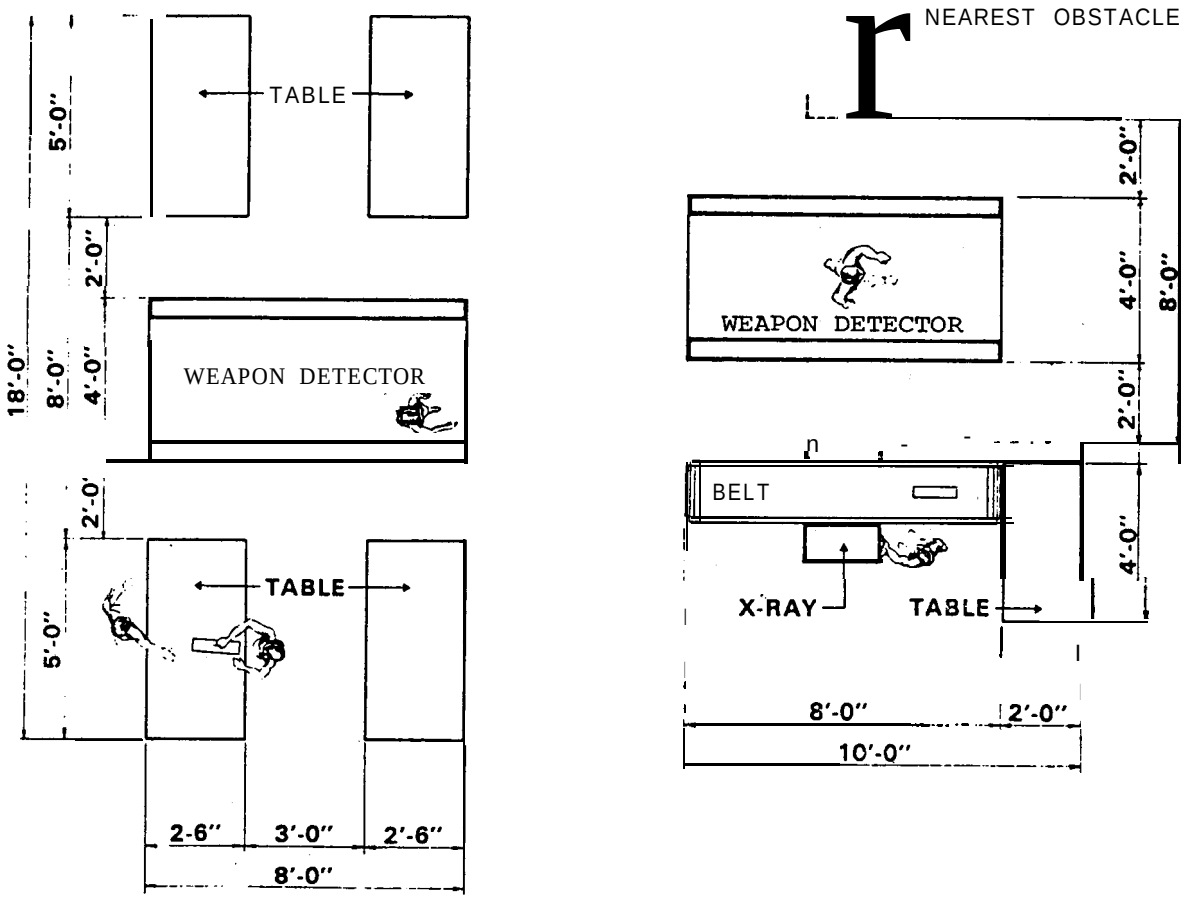


Figure 5-21. Security Inspection Station Layouts

f. Space leading to the security inspection station should allow room for queuing as the flow of passengers through security is often interrupted when a passenger requires a rescreening or physical search. Queuing space should not extend into or block other circulation elements.

g. The boarding area beyond a security screening checkpoint, whether a holding area concourse or departure lounge, requires a design which will enable security to be maintained. In this respect, the design and location of entrances, exits, fire doors, concessions, etc., require special consideration.

h. Other security considerations are discussed in Chapter 8.

74. DEPARTURE LOUNGES.

a. The departure lounge is the waiting or holding area for passengers immediately prior to boarding an aircraft. At most airports (excepting some low activity airports), departure lounges are normally included in the space leased and controlled by individual airlines.

b. The departure lounge normally includes: space for one or more airline agent positions for ticket collections, aircraft seat assignment, and baggage check-in; a seating and waiting area; a queuing area f aircraft boarding; and an aisle or separate corridor for aircraft deplaning. Figures 5-22, 5-23, 5-24, and 5-25 illustrate typical departure lounge layouts.

c. The number of agent positions/desks is determined by the user airlines on the basis of individual airline standards for passenger waiting, processing, and boarding procedures. A queue length of at least 10 feet (3 m) in front of agent positions should be provided in departure lounges at larger airports.

d. The departure lounge area is a function of the number of passengers anticipated to be in the lounge 15 minutes prior to aircraft boarding. Table 5-3 presents information for estimating departure lounge areas on the basis of aircraft seating capacity and load factors. The average depth of lounge area generally considered to be reasonable is 25 to 30 feet (8 to 9 m).

Table 5-3. Departure Lounge Area Space Requirements

Aircraft Seating Capacity	Departure Lounge Area Square Feet (Square Meters)		
	Boarding Load Factors		
	35-45 percent	55-65 percent	75-85 percent
Up to 80	350 (33)	515 (48)	675 (63)
81 to 110	600 (56)	850 (79)	1,110 (102)
111 to 160	850 (79)	1,175 (109)	1,500 (139)
161 to 220	1,200 (111)	1,600 (149)	2,000 (186)
221 to 280	1,500 (139)	2,000 (186)	2,500 (232)
281 to 420	2,200 (204)	3,000 (279)	3,800 (353)

e. When a lounge area serves more than one aircraft gate position, the estimated total lounge area shown in Table 5-3 may be reduced 5 percent for each aircraft gate position, up to a maximum of six gates.

f. Departure lounge seats are not generally provided to accommodate all passengers boarding an aircraft. A number of passengers will elect to remain standing in the waiting area while others will only arrive shortly before or during the boarding process. Between 15 and 20 square feet (1.4 to 1.9 m^2), including aisle space, is required per seat.

g. The deplaning area is generally a roped aisle or separate corridor directly leading deplaning passengers from the loading bridge or apron gate to a public corridor. Separation from the rest of the departure lounge is provided to avoid interference and congestion between deplaning passengers and those waiting to board the aircraft. Six feet (2 m) is an acceptable width for this area.

75. BAGGAGE CLAIM FACILITIES.

a. Inbound baggage handling requires both public and nonpublic building areas. The public space (claiming area) is that in which passengers and visitors have access to checked baggage displayed for identification and claiming. Nonpublic space is used to off-load bags from carts and containers onto claim devices or conveyor systems for moving into the public area.

b. The claiming area should be located adjacent to a deplaning curb and have convenient access to ground transportation service and auto parking facilities. Passenger access from arriving flights should be direct and avoid conflicting with enplaning passengers. The claim area should also be readily accessible from the aircraft apron by means of carts, tractors, or mechanical conveyors for quick and direct baggage delivery.

c. At low activity airports, a simple claim shelf is the most common baggage claim scheme. As passenger activity increases, several types of mechanical claim devices, as illustrated in Figure 5-26, may be utilized to help reduce the overall required claim area length. A discussion of the more common claim schemes follows.

(1) The simple shelf or counter is merely a shelf or counter provided in a public area on which baggage from an arriving aircraft is placed for passenger identification and retrieval. Width of the shelf is generally 30 to 36 inches (75 to 90 cm). Passengers merely move laterally along the shelf until their baggage is located and claimed.

(2) Flat-bed plate devices are particularly applicable when direct feed loading areas are immediately adjacent and parallel to the claiming area and on the same floor level.

(3) Sloping-bed devices are somewhat more adaptable for remote feed situations where the loading area cannot be immediately adjacent to the claiming area or must be located on a different floor level. In some cases, the width of the sloping bed is sufficient to provide storage of two rows of bags.

d. At low volume airports, exclusive-use facilities are not usually economically justified and claim facilities are shared or assigned preferentially to several airlines. The use of a Design Day Activity Analysis (see paragraph 24) is recommended to size baggage claim facilities. In this analysis, passenger arrivals in periods of peak 20 minutes are used as the basis for sizing. However, when exclusive facilities are planned, each airline determines its baggage claim frontage and space requirements according to its own criteria for sizing space, systems, and staffing.

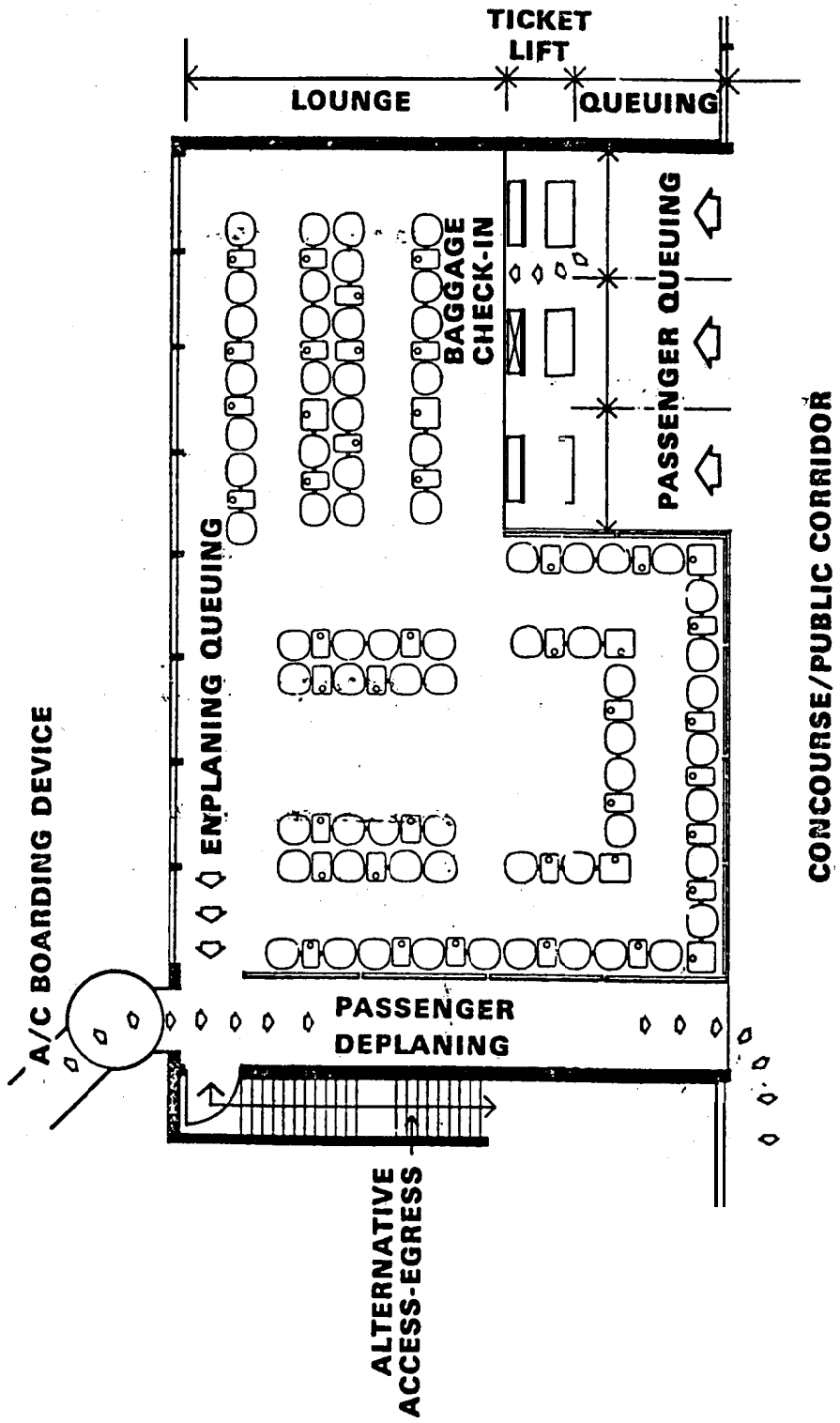


Figure 5-22. Typical Departure Lounge Layout

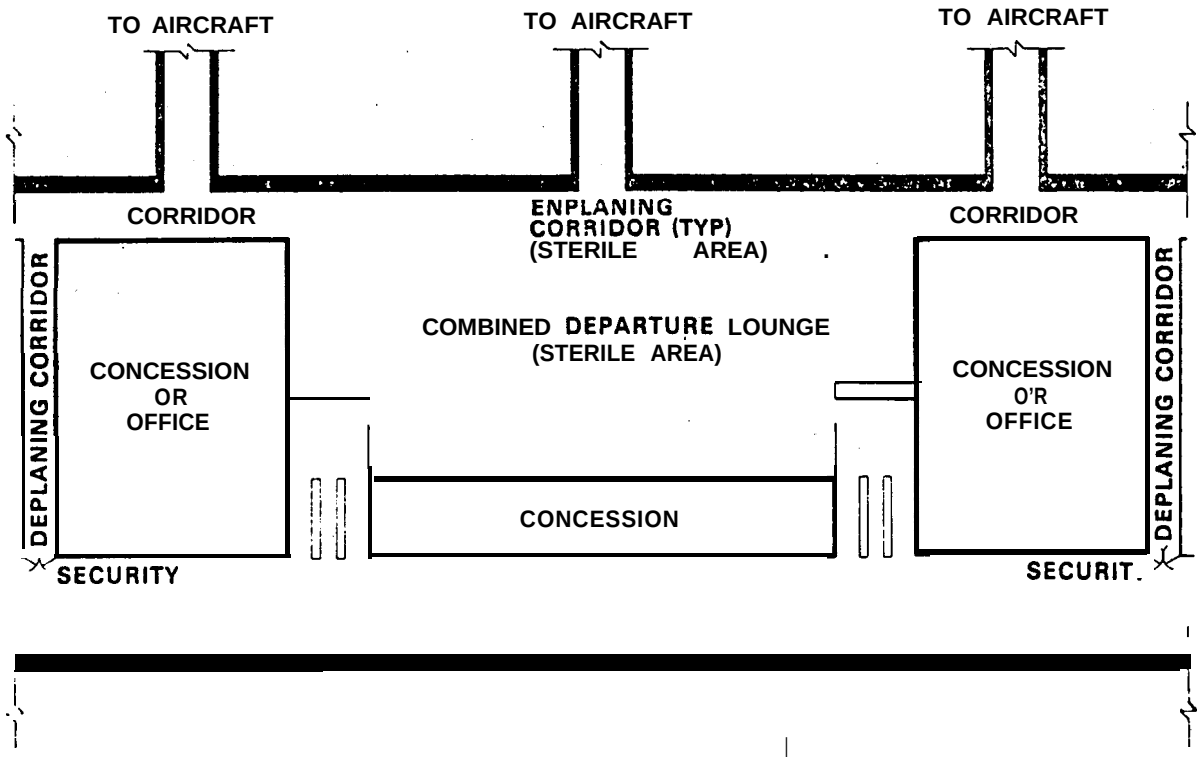


Figure S-23. Typical Combined Security/Departure Lounge Layout

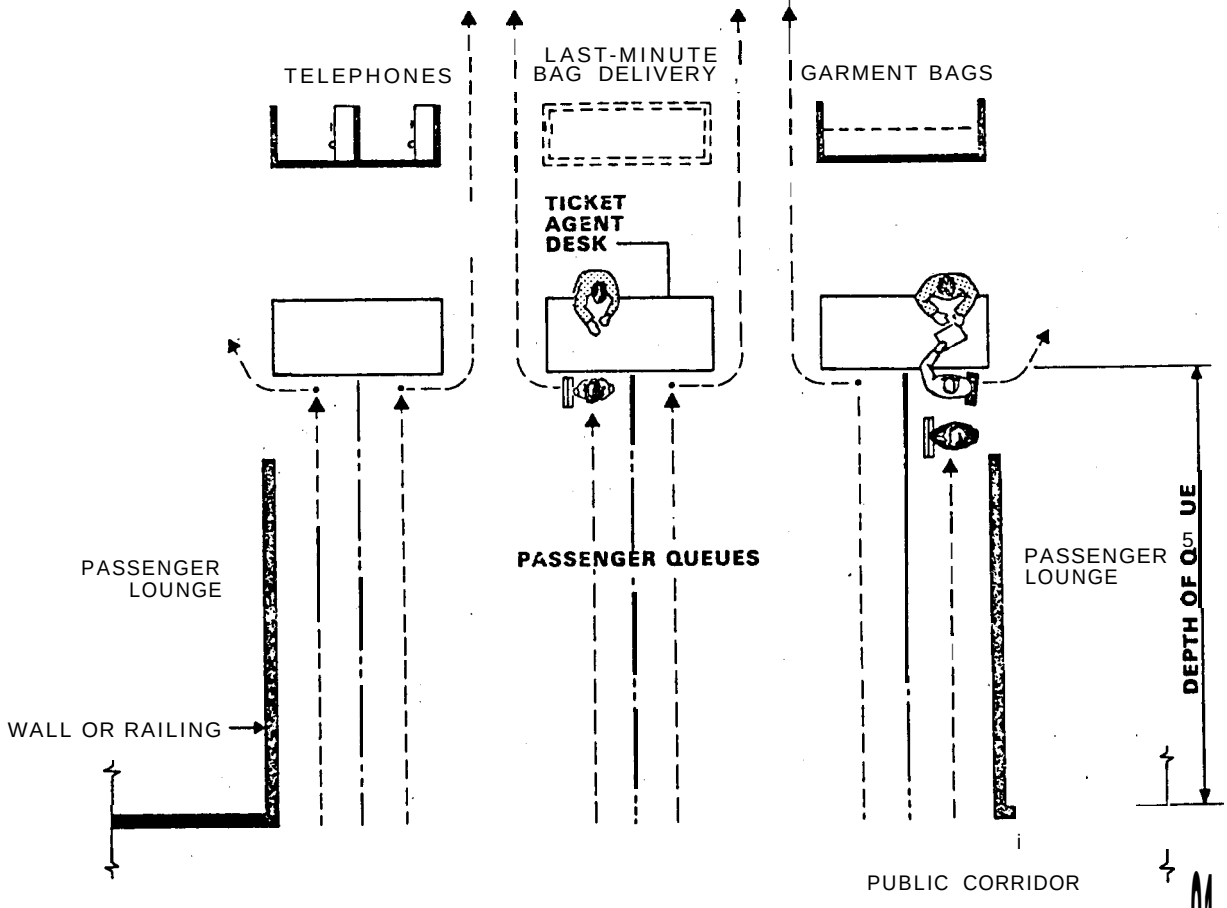
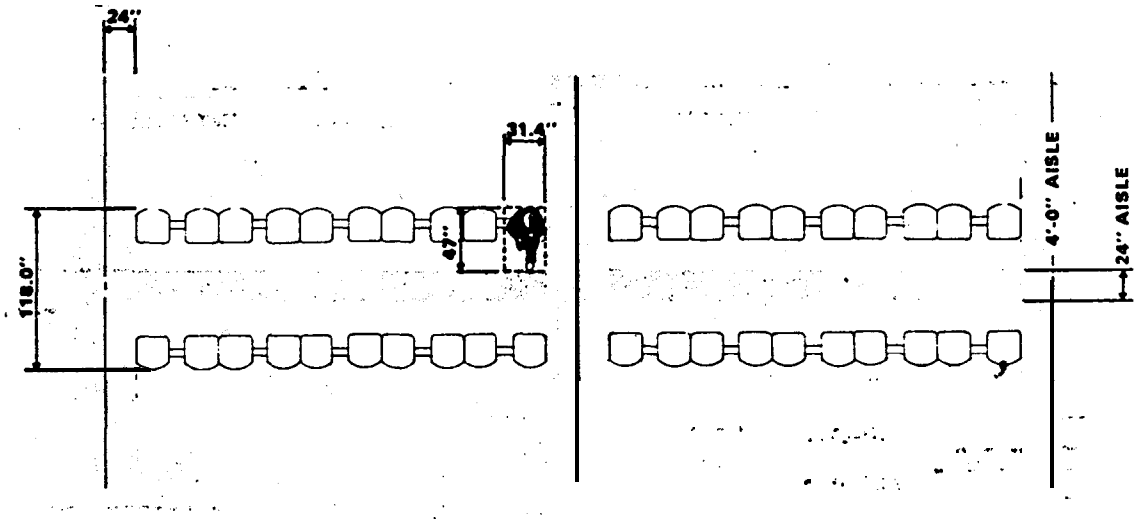


Figure S-24. Departure Lounge Passenger Processing Area



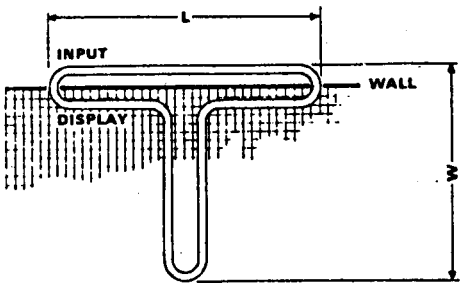
AREA/PASSENGER = 12.87 SQ FT

AREA/AISLE = $\frac{48 \text{ IN.} \times 118 \text{ IN.}}{144 \text{ SQ IN.} \times 20^{*}} = 1.97$ SQ FT

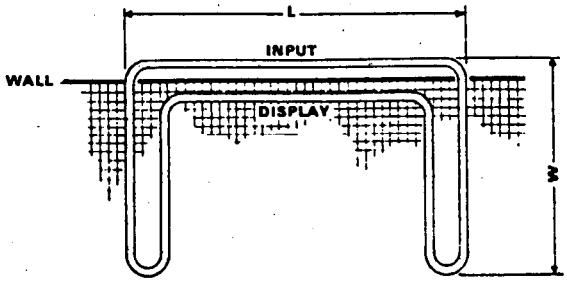
TOTAL AREA/SEATED PASSENGER = $\frac{(118 \text{ IN.} \times [illegible] 10 \bullet [illegible] \text{ PAIRS}) + (48 \text{IN} \times 118 \text{IN.}) = 14.83 \text{ SQ FT.}}{114 \text{ SQ. IN.} \times 20 \bullet 88 \text{elom8}} = 15$ SQ. FT./PASS.

*ONE UNIT LENGTH OF AISLE
4'-0" WIDE WILL SERVE
20 SEATED PASSENGERS

Figure 5-25. Departure Lounge Typical Seating/Aisle Layout

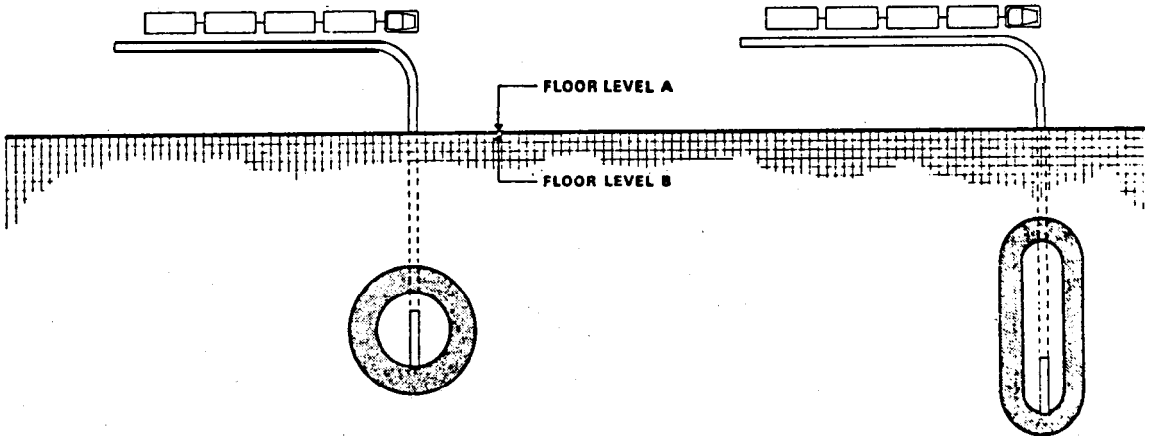


FLATBED — DIRECT FEED



FLATBED — DIRECT FEED

SHAPE	L&W (FT)	CLAIM FRONTAGE (FT)	BAG STORAGE*
OVAL	65 x 5	65	78
	85 x 45	180	216
	85 x 65	220	264
	50 x 45	190	228



CIRCULAR
REMOTE FEED SLOPING BED

OVAL
REMOTE FEED SLOPING BED

DIAMETER (FT)	CLAIM FRONTAGE (FT)	BAG STORAGE*
20	63	94
25	78	132
30	94	169

L&W (FT)	CLAIM FRONTAGE (FT)	BAG STORAGE*
36 x 20	95	170
52 x 20	128	247
68 x 18	156	318

* THEORETICAL BAG STORAGE—PRACTICAL BAG STORAGE CAPABILITY IS 1/3 LESS

Figure S-26. Mechanized Claim Devices

e. A public claiming area may require railings or similar separation from other public space and controlled egress to enable inspection of removed baggage for assurance of "positive claim." At some terminals, additional space may be needed adjacent to the claiming area for storage and security of unclaimed baggage and for airline baggage service facilities (lost and found).

f. For planning purposes, claim display frontage can be estimated by the use of either Figure 5-27 or 5-28. These nomographs utilize "Equivalent Aircraft Arrivals" (see paragraph 28) to approximate deplaning passengers in a 20 minute peak period, assuming an average of 1.3 bags per deplaning passenger. The claiming frontage requirements may be converted to baggage claim facility area requirements by, using Figure 5-29. The value presented includes: space for public circulation; area normally required within a controlled "positive-claim*' facility; and space for airline baggage service facilities. It should be recognized that considerable variance in space requirements occurs between airports due to airline company policies and the number of airlines using a claim area.

g. Figure 5-30 can be used to approximate the nonpublic space required to input and load bags onto claim devices. The figure assumes a 22 foot (7 m) depth, 20 feet 6 m) for the fixed shelf, behind the input section or belt for offloading carts and for passing/maneuvering. At many airports in mild climates, the nonpublic baggage input area may be satisfied without complete enclosure in the'terminal building through use of overhead canopies. This can also apply to the public baggage claim area at some low volume airports.

h. The area approximations developed from Figures 5-29 and 5-30 assume a relatively efficient use of building space. At existing terminals being modified to accept a claim device installation, additional space per foot of claim display may be required because prior column locations limit the efficient area use.

i. The baggage claim lobby area for public circulation and passenger amenities and services is discussed in paragraph 69c.

76. AIRLINE OPERATIONS AREAS.

a. Airline operations areas are those areas occupied by airline personnel for performing the functions related to aircraft handling at the gate. Composition of functions will vary among individual airports. The following areas are most commonly required:

(1) **Cabin Service or Commissary –** an area for the storage of immediate need items for providing service to the aircraft cabin.

(2) **Cabin Service and Ramp Service Personnel –** an area for training facilities and a ready/lunch room.

(3) **Aircraft Line Maintenance –** for supplies, tools, storage, personnel, etc.

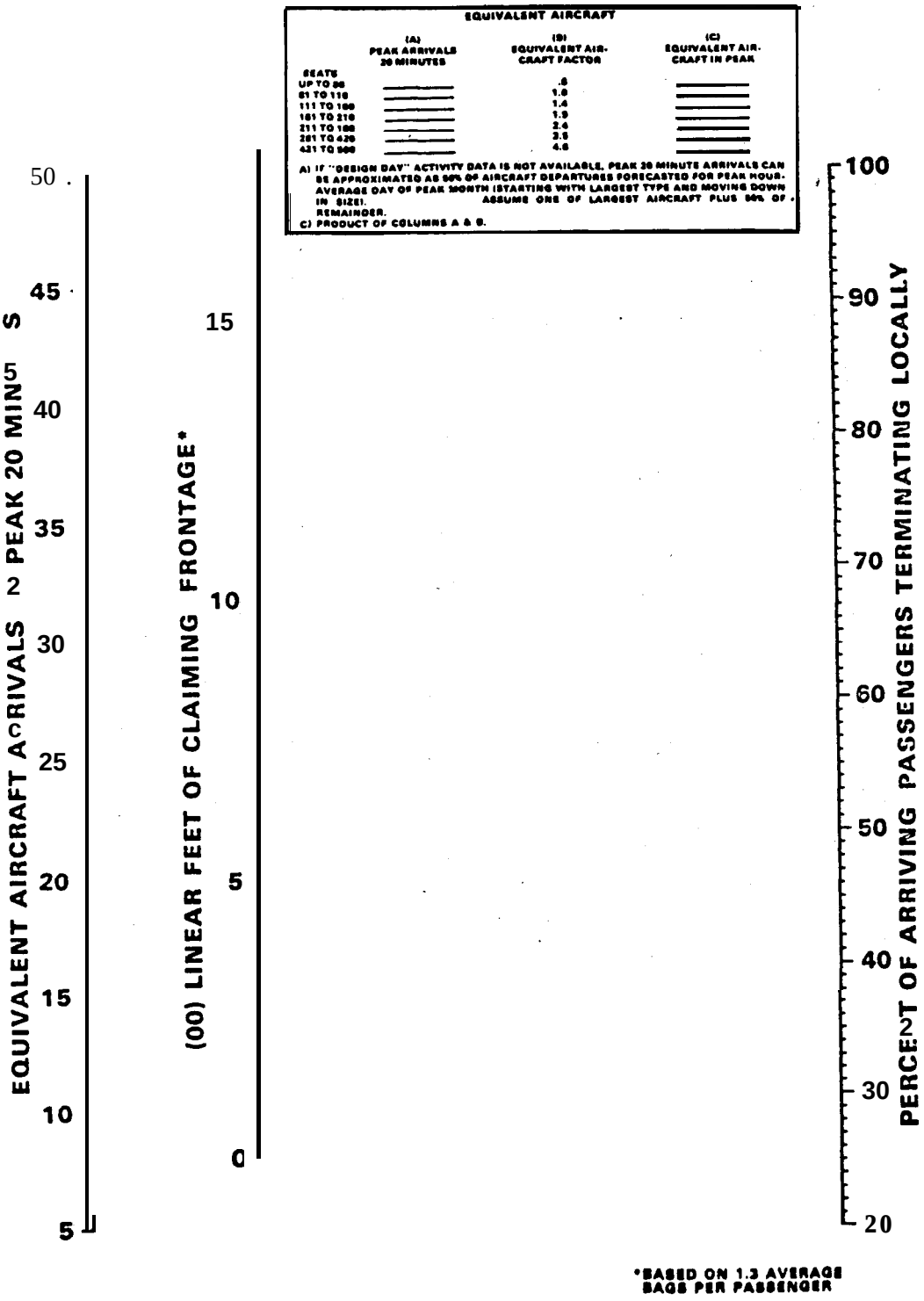


Figure 5-27. Inbound Baggage Claim Frontage - Less than Five EQA Arrivals in Peak 20 Minutes

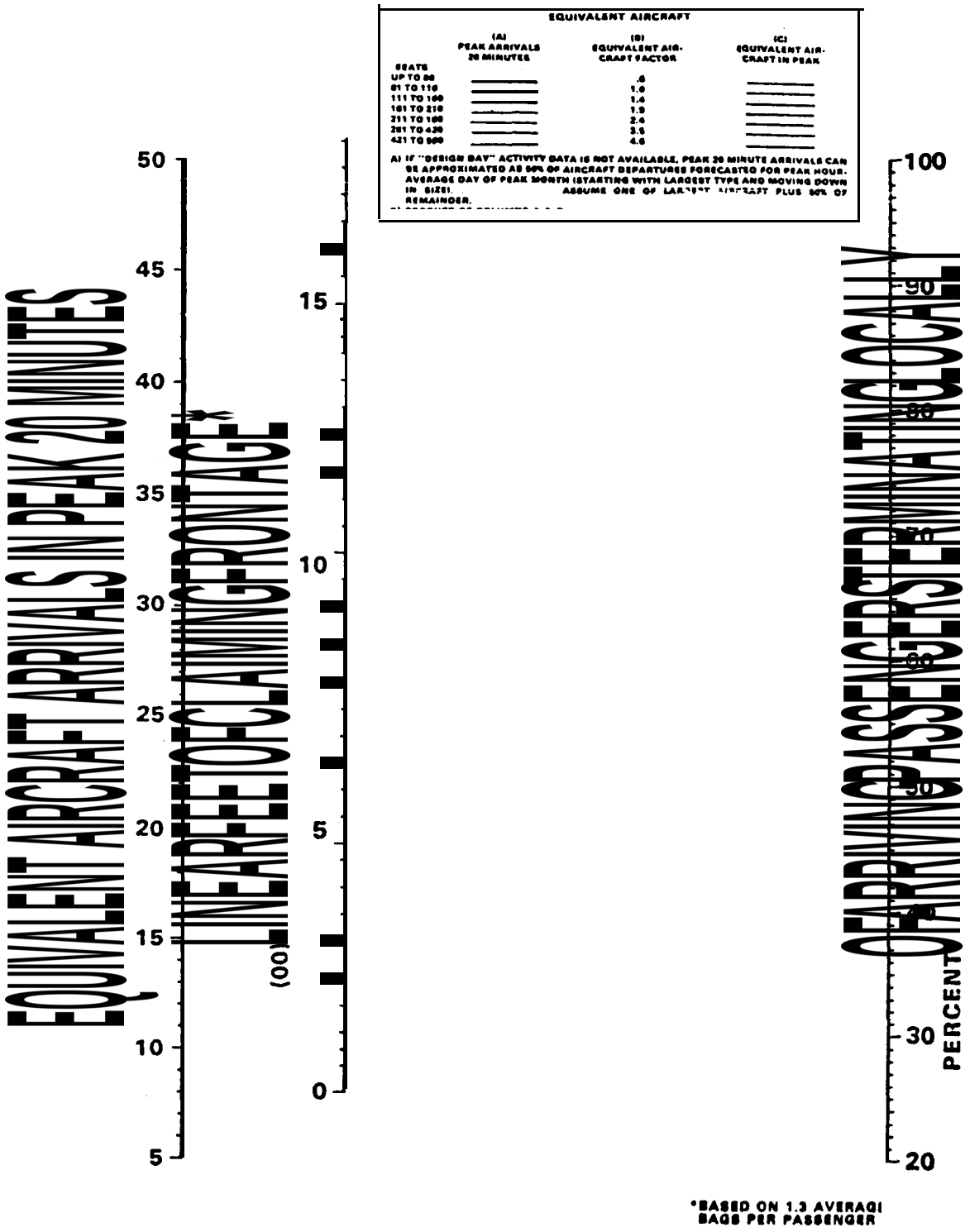
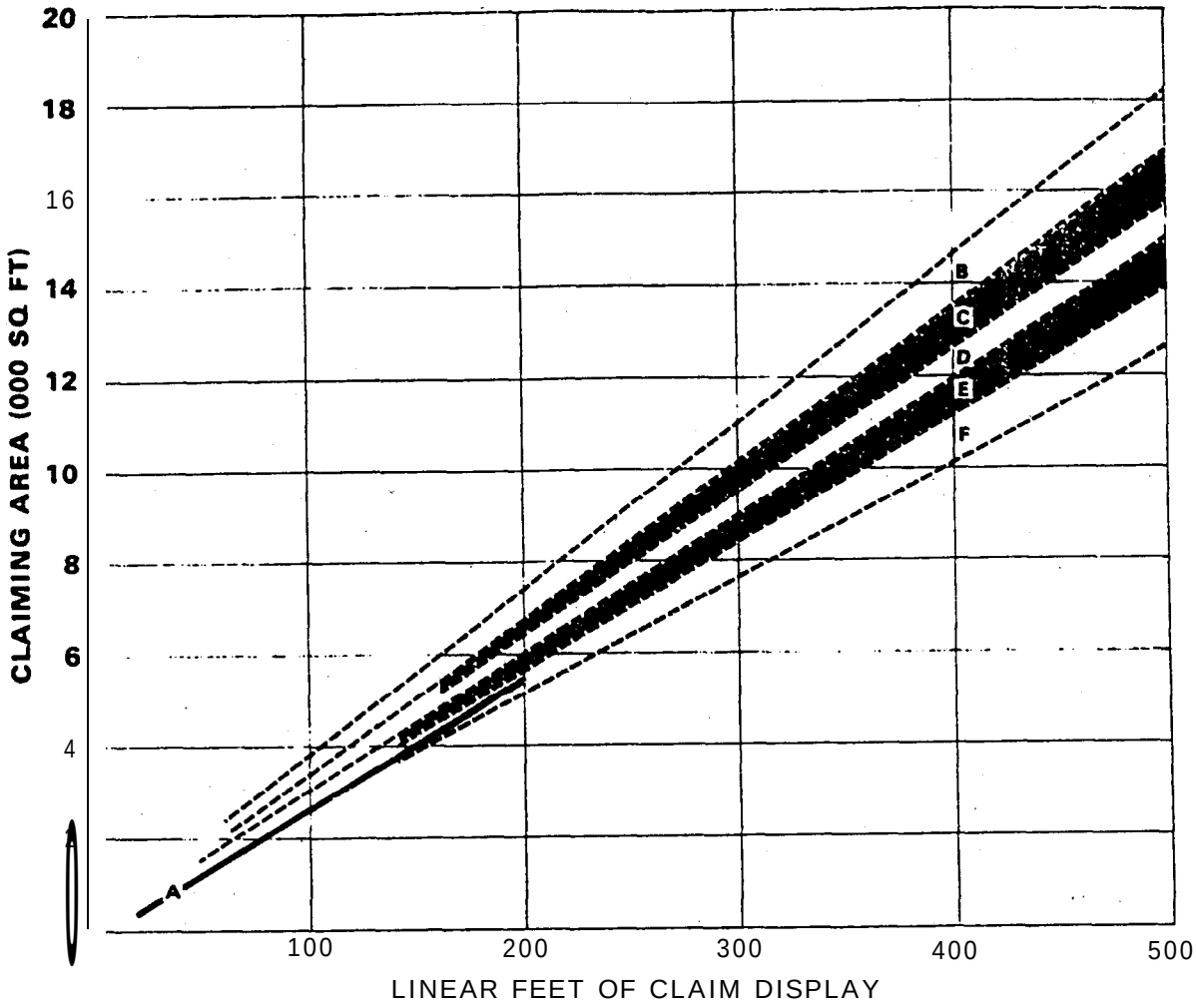


Figure 5-28. Inbound Baggage Claim Frontage - Five or More EQA Arrivals in Peak 20 Minutes



AREAS' FOR OPTIMUM CONFIGURATIONS OF:

A FIXED SHELF

B **ROUND** — SLOPING BED/REMOTE FEED
TEE — FLAT BED/DIRECT FEED

C TEE AND U-SHAPE ALTERNATING @ 75'
(FLAT BED/DIRECT FEED)

0 OVAL — FLAT BED/DIRECT FEED
OVAL — SLOPING BED/REMOTE FEED

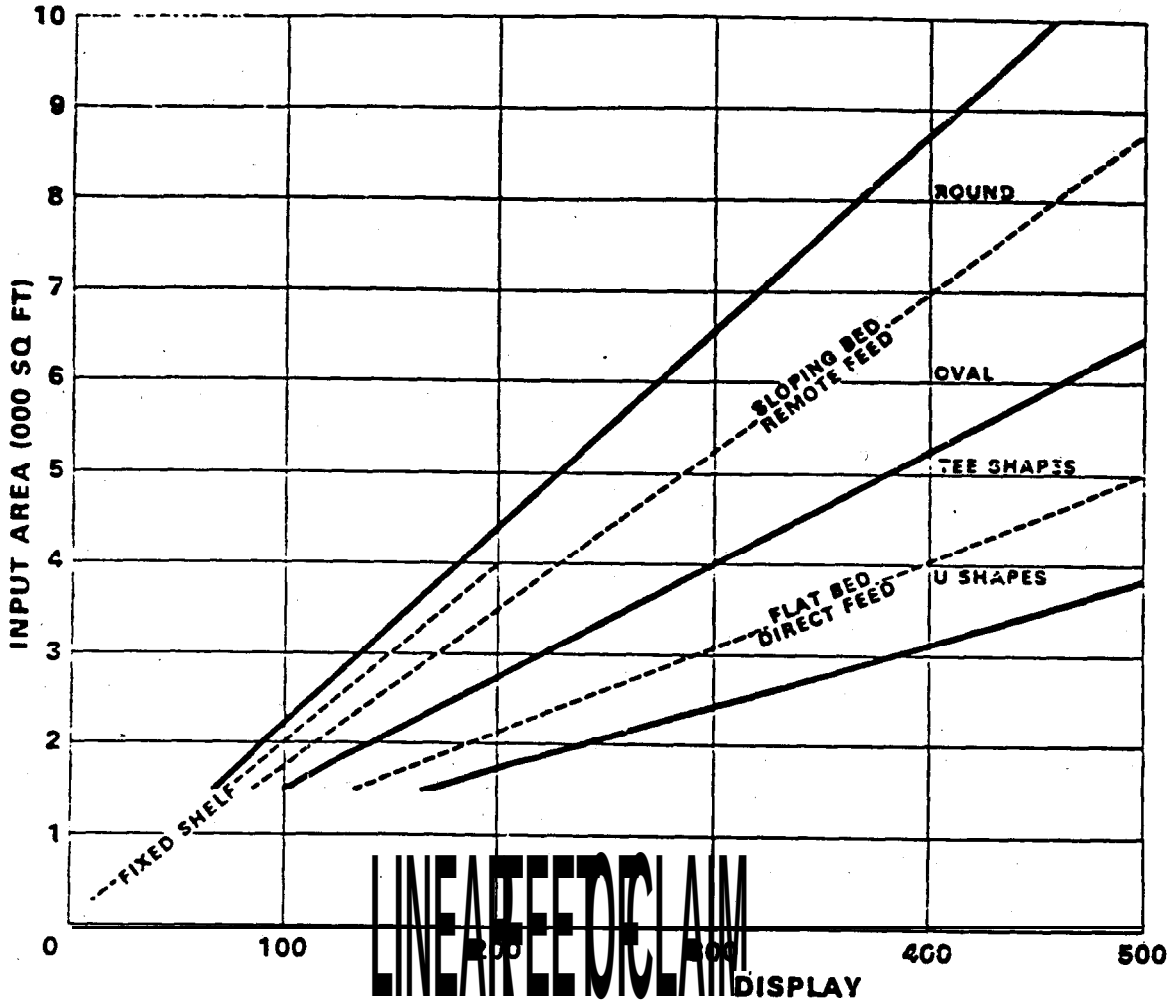
E TEE-AND U-SHAPE ALTERNATING @ 60
(FLAT BED/DIRECT FEED)

F ⊥⊥ -SHAPE **FLAT** BED/DIRECT FEED

* INCLUDES INPUT SECTION
Of FLAT BED DEVICES

NOTE: FIND DISPLAY LENGTH FROM FIGURES 5-27 OR 5-28.
THEN SELECT DEVICE AND READ RANGE OF REQUIRED AREA.

Figure 5-29. Baggage Claim Area



NOTES: WERE INTERIOR JOINT-USE DRIVES ARE REQUIRED, INCREASE OUTPUT AREA BY 35%.

FIND DISPLAY LENGTH FROM FIGURES 5-27 OR 5-28. THEN SELECT DEVICE AND READ RANGE OF REQUIRED AREA.

Figure 5-30. Non-Public Baggage Claim Input Area

(4) Office Area – for managerial personnel and clerks.

(5) **Flight Operations Facilities –** includes a message center, area for meteorological data and flight plans, and flight operations personnel.

(6) Flight Crew and Flight Attendant Facilities – includes an area for resting, toilet facilities, and personal grooming area.

(7) Secure Area Storage – for items requiring secure storage because of either the value or fragility of the items.

(8) Volatile Storage – for items requiring extra precautionary storage due to instability in handling and storage.

b. Storage and administrative areas often can and are combined. Depending on flight schedules, flight crew and flight attendant facilities may not be required or can be combined with facilities for other airline personnel. Similarly, facilities for flight operations and administrative personnel can be combined.

c. The area required for airline operations may be estimated for planning purposes on the basis of 500 square feet (46.5 m^2) per equivalent peak hour aircraft departure. This factor includes all of the operations areas previously described. However, at some airports one or more airlines may use additional terminal space for regional or airline system functions and/or other support services beyond those functions common to daily airport operations.

77. FOOD AND BEVERAGE SERVICES.

a. These s&vices include snack bars, coffee shops, restaurants, and bar lounges. The basic service offered at small airports is the coffee shop, although separate restaurants at some smaller city airports can be successful, depending on the community and restaurant management. Large airports usually can justify several locations for snack bars, coffee shops, bar lounges, and restaurants. Requirements for more than one of each type are highly influenced by the airport size and terminal concept involved. Unit terminals, for instance, may require coffee shops and/or snack bars at each separate terminal.

b. Generally speaking, a coffee shop seating less than 80 is considered an uneconomical operation at airports enplaning over one million passengers annually. At smaller airports, the seating capacity minimum may be somewhat lower, depending on such factors as local labor costs and concessionaire lease arrangements.

c. The following ranges appear representative for food and beverage services:

(1) Turnover rates: 10 to 19 average daily per seat. Some operators appear satisfied averaging 10 to 14 daily.

(2) Space per seat: 35 to 40 square feet (3.3 to 3.7 m^2) per coffee shop/restaurant seat, including support space.

(3) Snack bars: 15 to 25 percent of coffee shop/restaurant overall space requirements.

(4) Bar lounges: 25 to 35 percent of coffee shop/restaurant overall space requirements.

d. The sizing of food and beverage services involves applying "use factors." Use factors are determined by dividing the average daily transactions by average daily enplanements. Figure 5-31 shows ranges of food and beverage service areas for coffee shop and restaurants, snack bar, bar lounge and kitchen sup: port space for various "use factors."

e. For estimating and for initial planning purposes, the following average daily use factors are suggested:

(1) 40 to 60 percent at terminal airports with a high percentage of long-haul flights;

(2) 20 to 40 percent at transfer airports and through airports; and,

(3) 15 to 25 percent at terminal airports with a low percentage of long-haul flights.

78. CONCESSIONAIRE AND BUILDING SERVICES. The following building and concessionaire services are provided at airport terminals as appropriate for the size and activity of the airport. General area ranges for many of these services are presented for planning purposes. Larger areas may be required. Figure 5-32 provides a nomograph for approximating total area requirements for those services discussed in subparagraphs a. through s. The requirements presented in paragraphs t. through v. are determined separately on a case-by-case basis.

a. News and tobacco are physically separate at most airports where annual enplanements exceed **200,000** per year, and may be combined with other services at airports with lesser traffic. Space allowance: 150 square feet minimum, and averaging 600 to 700 square feet (56 to 66 m^2) per million annual enplanements.

b. Gift and apparel shops operations are combined with a newsstand at smaller airports. Separate facilities normally become feasible when annual enplanements exceed one million. Space allowance: 600 to 700 square feet (56 to 66 m^2) per million annual enplanements.

c. **Drug store,** including sale of books, cards, and liquor, may be feasible as separate operation when annual enplanements exceed 1.5 million. Space allowance: 700 square feet (66 m^2) minimum and averaging 600 to 700 square feet (56 to 66 m^2) per million enplanements.

d. Barber and shoe shine operations at some large airports allow one chair per million annual enplanements. The most successful operations range from three to seven chairs. Space allowance: 110 to 120 square feet (10.2 to 11.2 m^2) per chair with 150 square feet (14 m^2) for a minimum facility.

e. Auto rental counters vary according to the number of companies. Space allowance: 350 to 400 square feet (33 to 37 m^2) per million annual enplanements.

f. Florist shop operation as a separate function may become feasible when annual enplanements exceed 2 million. The usual space allowed is 350 to 400 square feet (31.5 to 32 m^2) per terminal.

g. Displays (including courtesy phones for hotels). Space allowance: 90 to 100 square feet (8.4 to 9.3 m^2) per million annual enplanements.

h. Insurance (including counters and machines). Space allowance: 150 to 175 square feet (14 to 16 m^2) per million annual enplanements.

i. Public lockers require in the range of 70 to 80 square feet (6.5 to 7.4 m^2) per million annual enplanements.

j. Public telephones space requirement is 100 to 110 square feet (9.3 to 10.2 m^2) per million annual enplanements.

k. Automated post offices may be found desirable to the extent of providing one station, 125 square feet (11.6 m^2) for each terminal serving at least 2.75 million annual enplanements.

l. **Vending machine** items supplement staffed facilities, especially when extended hours of operation are not justified by low volumes or multiplicity of locations. When vending machines are provided, they should be grouped and/or recessed to avoid encroaching upon circulation space for primary traffic flows. Space allowance: 50 square feet (4.7 m^2) minimum or 150 square feet (14 m^2) per million annual enplanements.

m. Public toilets are sized for building occupancy in accordance with local codes. Space allowances applied at airports vary greatly. They range from 1,500 to 1,800 square feet (140 to 167 m^2) per 500 peak-hour passengers (in and out) down to 1,333 square feet (124 m^2) per million annual enplanements at large hub airports.

n. Airport management offices' space requirements vary greatly according to the size of staff and the extent to which airport authority headquarters are located in the terminal. Accordingly, Figure 5-32 excludes space requirements for airport authorities and includes only such space as is representative of an airport manager and staff.

o. Airport Police/Security Office space needs vary according to based staff and nature of arrangements with local community law enforcement agencies.

p. Medical aid facilities' space requirements range from that needed for first-aid service provided by airport police to that for branch operations at off-airport clinics.

q. USO/Travelers Aid facilities vary considerably. Space requirements are relatively minor, 80 to 100 square feet (7.4 to 9.3 m^2), except at airports with annual enplanements of over one million.

r. Nursery facilities for travelers with small infants have been provided at airports with annual enplanements of over 1 million. The most practical solutions include a private toilet room of 50 to 60 square feet (4.7 to 5.6 m^2) with facilities for changing and feeding. The number of such facilities may range from two up, depending upon terminal size and configuration.

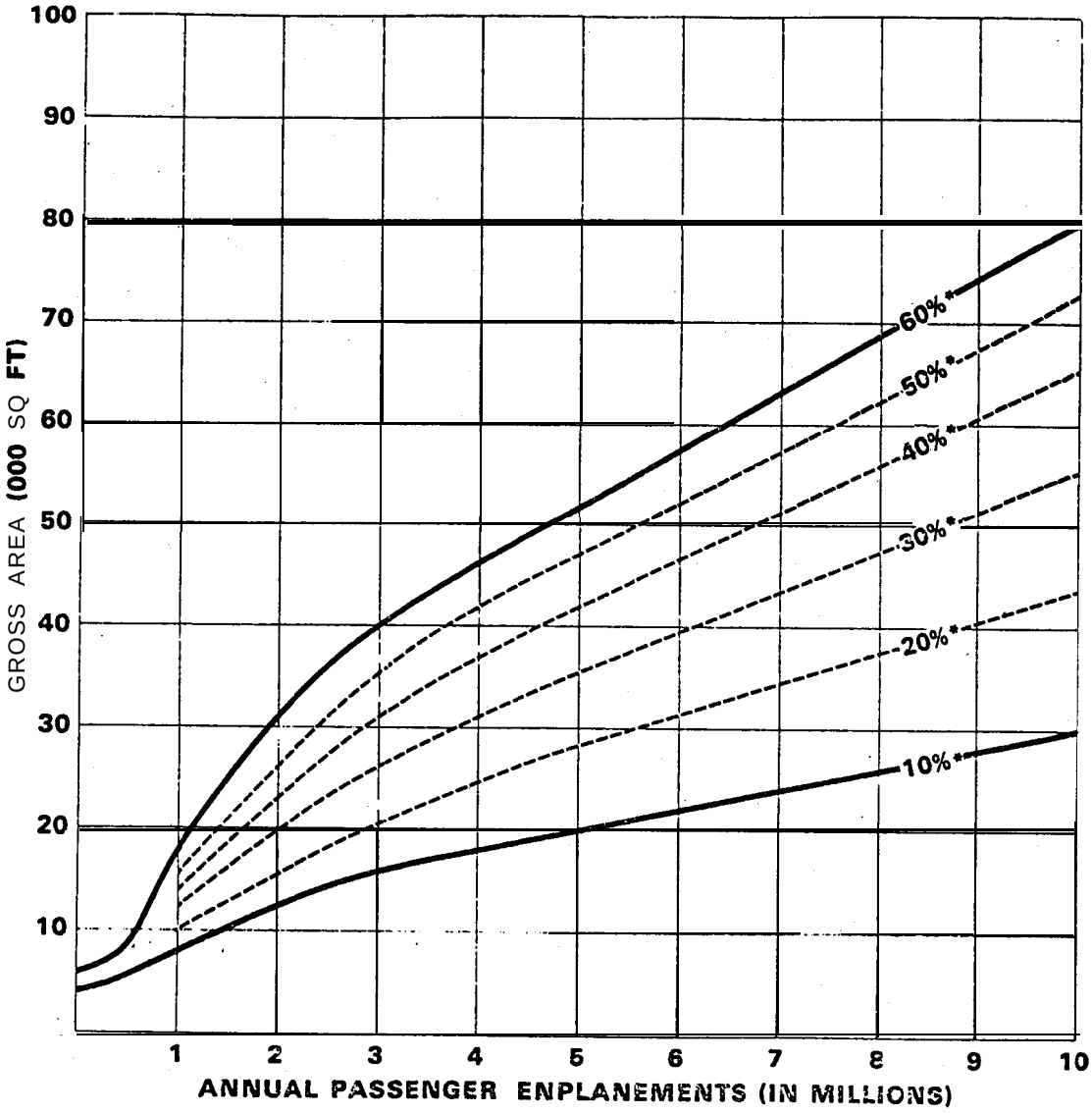
s. Building maintenance and storage varies, depending upon the types of maintenance (contracted versus authority operated) and storage facilities available in other authority-owned buildings.

t. Building mechanical systems (HVAC) space ranges from 12 to 15 percent of the gross total space approximated for all other terminal functions. A value of 10 to 12 percent is used in relation to the connector element space. This allowance does not cover separate facilities for primary source heating and refrigeration (H&R plants).

u. Building structure space allowance for columns and walls is 5 percent of the total gross area approximated for all other functions.

v. Other space, as determined on a case-by-case basis, may be required at some airports for information services, government offices, contract service facilities and the like.

79. - 90. RESERVED.



* AVERAGE DAILY USE FACTOR FOR COFFEE SHOP AND RESTAURANT

NOTES:

1. SPACE FOR EMPLOYEE CAFETERIA IS INCLUDED WHEN ENPLANEMENTS EXCEED 0.8 MILLION/YEAR
2. FOR AIRPORTS WITH ENPLANEMENTS OVER 10 MILLION TO 20 MILLION /YEAR, USE 50% ENPLANEMENTS AND MULTIPLY AREA BY 2
3. FOR DECENTRALIZED (UNIT) TERMINALS OR SATELLITE CONCEPTS WITH MULTIPLE COFFEE SHOPS, CALCULATE AREAS PER UNIT TERMINAL

Figure 5-31. Food and Beverage Services

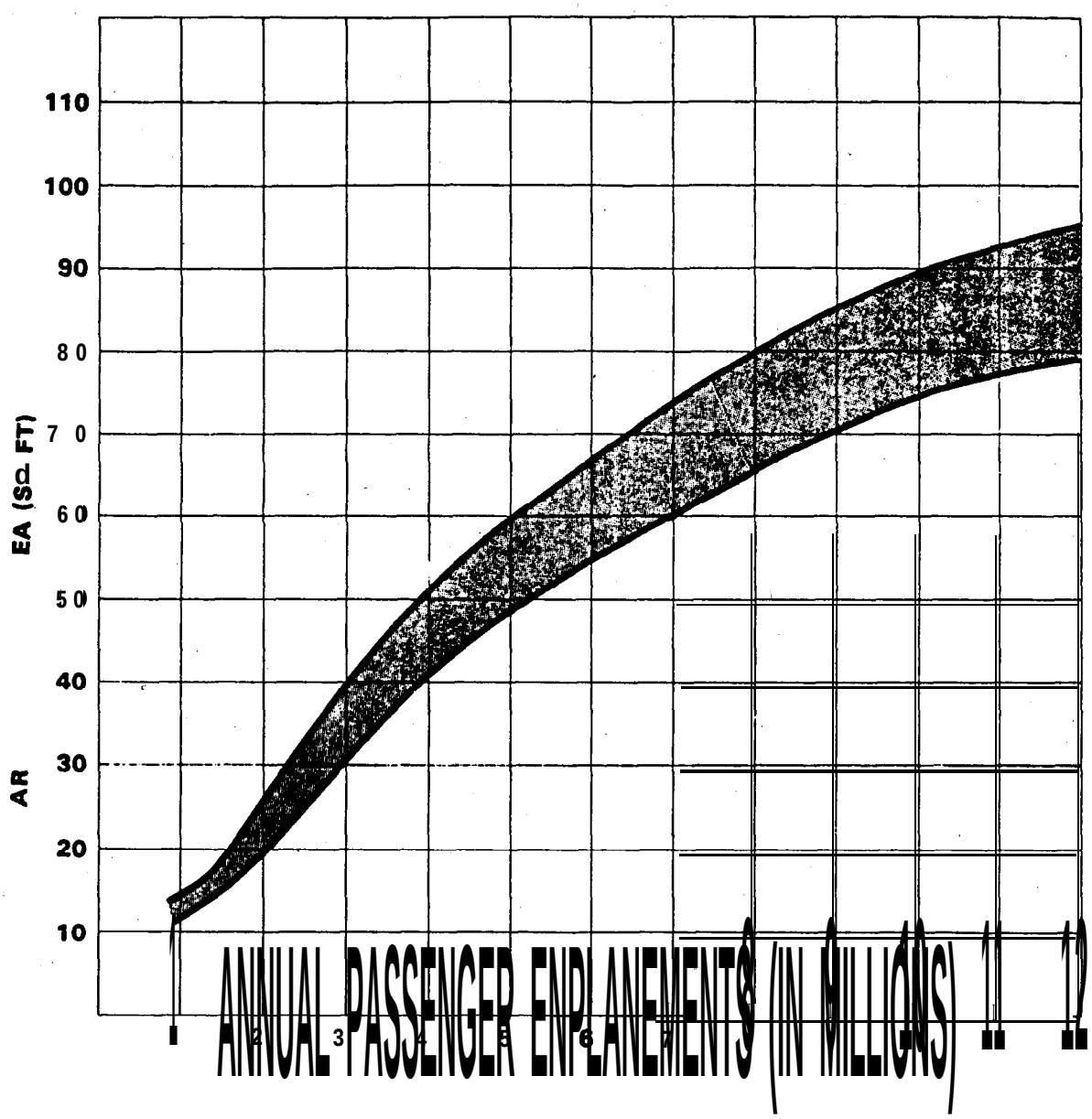


Figure 5-32. Concessions and building Services